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FIRE-RESISTANT LAMINAR POLYESTER PLASTIC

Moscow PLASTICHESKIYE MASSY in Russian No 5, 1977 p 75

[Article by S. Ye. Artemenko, S. A. Vilkova and M. A. Tyuganova]

The problem of imparting fire-resistant properties to reinforced plastics is currently being solved chiefly by introducing mineral fillers, antipyrenes to the binder, chemical modification of the binder during synthesis, or by applying fire-proof coatings [1]. However, synthisis of auto-extinguishing resins complicates production, while additives spoil some of their properties. Therefore, it was of interest to investigate the possibility of preparing fire-resistant compositions from standard resins by reinforcing them with fire-protective chemical fibers.

The reinforcing material used consisted of viscose fiber modified by graft-copolymerization of cellulose with the phosphoric acid salt of poly-2-methyl--5-vinylpyridene (OZV-PMVP) [2], and a fiber modified by grafting cellulose with phosphonitrile amide in the presence of bifunctional reagent N, N'--dimethylol urea (OZV-FNA) [3].

The high fire resistance of compositions reinforced with modified chemical fibers attests to the effectiveness of fire-protective fibers in the reduced flammability plastics (table). The materials prepared do not burn, do not glow after extinction of flames; loss of mass does not exceed 4.5 percent. In fire resistance, composite materials using fire-protective chemcial fibers exceed the well-known fiberglass based on resin NPS-609-22M [4].

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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

PROBLEMS OF COMPUTER SERVICING ORGANIZATION

Computer Servicing Problems Noted

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 Jul 77 p 2

[Article by Yu. Taranenko, sector chief of the "Pigment" Scientific Production Association, candidate of the engineering sciences, Leningrad: "How to Service Computers"]

[Text] There is no doubt of the need to increase the effectiveness of automated control systems and computer centers by combining them in an overall state system for information gathering and processing. Moreover, this problem is already being solved technically. However, the long term concentration of computers is generating a whole series of problems related to the organization of efficient servicing, software, passing operational experience, technical refinement, the training of specialists, etc.

An expedient alternative to departmental separation should be the combining of computer users on a regional scale. Here, one can organize the operation of consulting offices and schools with advanced experience in computer programming and operation, as well as hold conferences and seminars on urgent questions of the use of computer equipment in the national economy. In this case, it is right to figure on a substantial increase in the level and pace of the mastery of the technical capabilities of the machines on one hand, and on an increase in the labor productivity of personnel servicing the computers on the others. Each user is provided with the capability of rapidly and easily arranging business contacts with the enterprise which possesses the technical information of interest, i.e., achieving reasonable cooperation and specialization. A great part is played by collective efforts in the creation of a highly organized system for central technical servicing (TsTO) of the computers and peripherals.

However, right now in regions where there are hundreds of computers, thousands of users with questions, programmers and operators, the servicing is not set up in the best fashion. For example, in Leningrad, centralized servicing is realized for only one-fifth of the computers of the "Nairi" family. But even in this case, drawing up an order form for a repair takes an average of 3.8

hours. And the average waiting time for the start of the repair is 2.3 working days. If such a system were extended to all "Nairi" computers in our city, then with an average of 20 operational failures for each machine, the overall annual loss would amount to about a million rubles.

And what is being done with the distribution of technical servicing personnel? At some enterprises, workers in this category are busy for only part of the day, and at others, the administration cannot find the needed specialist, and machines are down for months because they are out of order.

Creating and maintaining a servicing system in working order proves to be a complicated affair. Experience has shown that it is not within the power of the public interdepartmental organizations of the type of hitherto existing associations of the users of computers of the various families: the "Minsk", "Mir", "Nairi", "YeS", etc. The councils of the affiliates of these associations act only through the activists, who are maximally loaded with their primary work. This is a reason for the fact that the work plans for the councils are drawn up according to the principle, "The less, the better." The fulfillment of the plan is actually not being promoted by anyone. In the majority of cases, there are no position papers concerning the work of the councils, affiliates, or associations. The presidia of the associations do not manage the affiliates in practice. Membership is a quite voluntary matter. Seeing that there is little coming out of these organizations, the majority of computer users prefer not to join an association.

It is thought that an association of computer users should have a statute, not be a society of amateurs acting only through "partial donations". Obviously, the drawbacks will be overcome only by means of a nucleus of staff workers. Additionally, it is necessary to draw on means which measure up to the complexity and importance of the problems.

The associations and their affiliates can be completely merged into one organization within the framework of a region. It is important that entry into this organization be obligatory for each enterprise having a computer. This is so that participation in its work is clearly regulated by the standards documentation. It is time to establish a normal state order here. An for this, it is thought that no special resolutions of central organs are needed; the rights of the executive committees of the local soviets are entirely adequate.

Leningrad Computer Service Discussed

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Sep 77 p 2

[Article by V. Fadeyev, head of the Department of Mathematical Modeling of the All-Union Scientific Research Institute for the Peat Industry, Leningrad: "Who is to Answer for Computer Servicing?"]

[Text] I would like to support Yu. Taranenko, who raised a very important question concerning the effectiveness of the computer equipment in use, in

his letter, "How to Service Computers" (SOTSIALISTICHESKAYA INDUSTRIYA, 19 July). In fact a paradoxical situation has come about: devices intended for improving the organization of production are ineffective specifically because of organizational reasons.

In Leningrad, there are enterprises which are obligated to carry out the centralized technical servicing of computers, but their capacities are unfortunately inadequate.

In supporting Yu. Taranenko in the fact that it is necessary for the servicing of electronic equipment to be put on a more reliable legal organizational footing, I would like to add: in this case, the users-consumers of computers should play the main role. Their associations should receiver real support both on the part of the governing organs in a region, and on the part of the ministries, the manufacturers of the equipment. For the latter listen to the opinion of the users: Would machines really be set up for series production with incompatible software? And today many of them speak different "languages".

I think that departmental interests will not diverge from national economic interests if in solving such general problems as the setting up of centralized servicing, the creation of computer centers for collective utilization, special organizations come forward as the initiators. Here in Leningrad, they can be the departments of the higher educational institutes, or the "Lensistemotekhnika" association. It is just impossible to allow those who supply the computers or service them to dictate the terms! Experience has shown: In the latter variant, the customer cannot escape playing the part of the supplicant.

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AUTOMATED ENTERPRISE MANAGEMENT SYSTEM 'LITSTANOK'

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May/Jun 77 pp 130-134

[Article by A. B. Baublis and V. A. Shakochyus]

[Text] The principal directions in technical policy in the applications and use of computers were determined in the Tenth Five-Year Plan in the machine tool and tool industry of the USSR.

From studies with reference to specific features of the enterprises in this industry, it was established that the most rational form of computer use as the technical base of automatic enterprise management systems [AEMS] is the setting up of shared-time computer centers intended for servicing with computers a group of closely situated enterprises and organizations in the industry.

Two types of shared-time centers are being set up: cluster type information computer centers (CICC) for solving economic problems of AEMS for enterprises of the cluster and territorial computer centers (TCC) combining functions of the CICC with centralized preparation of control programs for digital program control machine tools for enterprises in the territory served. The determining circumstance here was the fact that most (83.1 percent) of the industry's enterprises are in the group of small and moderate-sized units for which the purchasing, upkeep and operation of modern computers are extremely unprofitable. Here consideration was also paid to the fact that setting up CICC and TCC affords a significant reduction in the number of operators, even and planned buildup of technical means (computers, interfacing devices and data reduction units), methods of acquisition, recording and processing of data and the optimizing of the computer process in terms of time and cost criteria.

This article presents experience gained in developing and organizing the Vil'nyus TCC and in maintaining an automated enterprise management system under the general name AEMS Litstanok for five machine-tool plants: Komunaras, Zhal'giris, imeni 40-letiye Oktyabrya, Grinder Plant and Plant imeni F. Dzerzhinskiy, The ACMS Litstanok is an information-advice system.

Group designing was relied on in developing the AEMS Litstanok. This method helped in standardizing not only design materials and the information base of the system in all five plants, but went far in cutting down on the schedules for developing and incorporating the systems and in lowering the costs of studies on designing and incorporating the AEMS Litstanok by nearly twofold compared with what would be the case if the AEMS had been developed and incorporated separately for each enterprise. Fundamental to group designing was the standardization of the information base and the hardware and software of the AEMS Litstanok for all five machine tool-building plants of the cluster.

Brief specifications of plants. Machine tool-building plants linked together by the AEMS Litstanok fall into the small-plant category. They are specialized in making precision machine tools; organization of the industrial process rests on the identical methodological foundation.

Ranked by type of manufacturing and size of labor force, the plants are classed as medium plants with small-series and medium scale of manufacturing (the labor force at each plant is 1100 to 1900 persons). The organizational structure and makeup of management at all plants are built on the same principle; they are all subordinated to the same main administration of the USSR Machine Tool and Tool Building Industry--Glavtochstankoprom.

Analysis of information flows shows that because the volume and complexity of products made is growing, the manufacture program is dynamically changing and the number of labor and material standards is rising, the volume of computer operations in data processing is swelling. To illustrate: the number of parts-operations executed at each plant varies from 120,000 to 155,000; the number of operation-by-operation labor standards--from 77,000 to 125,000; the number of part-by-part material standards--from 9,000 to 16,000; the number of tools and accessories used--from 6,000 to 15,000 and so on.

Information base (IB) of AEMS. The basic principles underlie the standardization of the IB of the AEMS Litstanok: unity of the system of handbook-standards practices (HCP) and information linkup of the system's components (subsystems and functions); total standardization of the formulation of economic functions and development of solution programs, as well as the use and introduction of unified standard and industry forms of primary documents.

The information base of the AEMS Litstanok is distinctive on account of its systems approach to the selection of subsystems and functions and the unity of information support (IS), hardware and software.

The systems approach to the selection of subsystems and functions for a given AEMS is made possible by analysis of the interconnections between individual functional directions in the control process, by the selection--on this basis--of the key interconnected functions and by automation of the control function.

Complete and purposeful application of a computer makes possible in the future improvements and advances in the AEMS on the basis of a unified HSP.

The unity of the IS system lies in setting up a unified structure of handbook-standards information (HSI) embracing the principal material, labor and calendar-operational standards and the centralized conduct of most handbooks and price lists. Unified files and card files of HSP have been organized, underlying the rational organization of information retrieval needed in solving problems of updating. Multiple use of information and its extended storage are provided.

Unified requirements on the forms of input and output documents have been drawn up, embodying the convenience in filling out the forms. In use are standardized forms of primary documents provided by the YeSKD and YeSTD, as well as the forms confirmed by the USSR Central Statistical Administration and the USSR Ministry of Machine Tool and Tool Building.

Information entered onto the machine carriers by technical means is monitored. Information at a given level may be used for system improvement and advancement. Unified requirements are applied to input and output information in preparation; they amount to preliminary monitoring, reduction and transporting of the information from customer-plant to the TCC and back again.

The unity of the system hardware is embodied in the unified requirements on the set of technical means and the unified approach to their functioning and servicing, making use of unified software possible.

The unity of the system software lies in the maximum use of a standard software applied to the Minsk-32 computer in setting up programs of functions applied at plants with the same type of manufacturing and in the software of a system using as the principal algorithmic language COBOL, unified for all functions.

These subsystems are part of the AEMS Litstanok:

1. Handbook-standards practices (HSP)--three functions

2. Control of tooling-up (CTU)--six functions

3. Technical-economic scheduling (TES)--seven functions

4. Operational control of the principal manufacturing process (OCPM)--six functions.

5. Control of product quality (CPQ)--three functions

6. Control of material-technical supply (CMTS)--four functions

7. Control of tool department (CTD)--four functions

8. Record-keeping (RK)--eight functions

It must be noted that of the 40 functions introduced into the AEMS Litstanok, 32 are handled with a Minsk-32 computer in the TCC and eight functions--with punched-card computers (PCC) at each plant, separately.

Organization of the handbook-standards practices of the AEMS. Products made by a machine tool plant are marked by design and process complexity; the information used undergoes frequent changes. So keeping the handbook-standards practices viable is a very responsible and complex undertaking in plant activity.

The structure of the handbook-standards practices is unified at each of the five plants, as is the case also at the TCC; when called for, information is updated either at the plants or the TCC. Centralized upkeep of the handbooks and price lists no only significantly cuts back on the volumes of stored and processed handbook-standards information, but also frees plant personnel from continual monitoring of their completeness.

When the AEMS Litstanok was being compiled, close attention was paid to the system of classification and coding of handbook-standards and economic information. These main principles of coding were embodied in the system: the structure of codes was adopted with minimum number of digits and maximum logic; allowance was made for features of computers used in information processing, small-series and series character of manufacturing, existing principles of coding product lines and common designations and the option of further system expansion.

Codifiers developed and introduced in the first stage of the AEMS Litstanok are divided into centralized and decentralized, by the kinds of applications. Centralized codifiers are unified for all five plants. The procedures in their applications as well as all changes that arise are regulated by the Vil'nyus TCC. Decentralized codifiers are developed and applied individually at each plant. The procedures in their applications as well as all changes that arise are regulated by each plant; as this is done, overall requirements on the coding system and on the updating of the files stored in the TCC are retained.

Centralized management of HCP and the information coupling of the system permitted centralizing the management of the data base of the handbook-standards information of the TCC and using this information in performing system functions. Of the 29 codifiers used in the AEMS Litstanok, 20 are unified for all five plants and are managed in a centralized way in the TCC, that is, their initial formation and all changes are executed in the TCC; the TCC inform the appropriate services of plants that are part of the cluster about these actions. The unity of the classification and coding system made it possible, even during the development of the first stage of the AEMS Litstanok, to organize the centralized management of more than 50 percent of the handbooks and price lists used in the AEMS (10 of the 19 handbooks and

price lists used in the AEMS, 10 are managed in a centralized way). Centralized management of the "Spravochnik material'nykh resursov" [Handbook of Material Resources] numbering about 25,000 sentences reduced the volume of stored and processed information by nearly two and a half times.

Issuance and arrival at the management level of regulating and methods materials (state standards, classifiers, guiding technical materials and so on) are helping gradually to reduce the discrepancies in the organization of management at individual plants and increase the role of shared-time centers. As a result, the level of centralized management of HCP (codifiers, handbooks and price lists) will gradually rise until all plants served by the TCC are covered.

It must be noted that further expansion of the AEMS Litstanok does not need the radical restructuring of both the handbook-standards and information base as a whole and will follow the line of qualitative expansion and further enlargement of the system with the organization of information transmission to the TCC over communication channels by means of peripherals and with the periodicity of transmitted information to the shift level.

The formation, monitoring of completeness and the updating of the handbook-standards information is done by performing the functions of the subsystem of handbook-standards practices, forming 45 permanent files of handbook-standards information.

Performing the functions of handbook-standards practices permits recording, sorting and verifying completeness and updating changes in all files. In setting up the files of handbook-standards information, use is made not only of generally accepted methods of monitoring in the preparation of punched cards and punched tape, but also provided are methods of monitoring information on magnetic tape by comparing some files with others in terms of the leading requisite-features and also by inserting a series of restrictions into the program.

In the AEMS Litstanok formation of the general files of handbook-standards information can be done wholly or in stages, that is, if in the initial forming of a file there is an absence of some of the specified information, this does not interfere with the forming of a file of the remaining part of the information.

Hardware. The technical base of the AEMS Litstanok is made up of a complex of technical means concentrated in the Vil'nyus TCC (two sets of Minsk-32 computers, several auxiliary units for processing information and the corresponding set of units for preparing control programs for machine tools with numerical programed control) and technical means that are in the planning and introduction departments (PID) of the automatic production control system at each plant (the units for information reduction into punched cards and punched tape and the sets of punched-card and punched-tape computers).

Organization of operations in the PID of the automatic production control system (APCS). Departments of the planning and introduction of automatic enterprise control systems were set up to coordinate relationships between plants and the TCC, at the cluster plants.

In accordance with the technological process of the passage of functions, on the PID of the APCS is laid the satisfaction of the following main functions: the reception of information from the plant subdivisions and the feeding of resultant information to the plant services; transfer of information onto machine carriers; accumulation and storage of information on the manufacturing and economic activity of the plant; performance of functions at the punched-card/tape computers; reduction and transmission of information for processing in the TCC and also the reception of resultant information from the TCC; the setting up and management of the handbook-standards stock on machine carriers; operation and servicing of punched-card/tape computers, devices for data reduction onto punched tape and other equipment; in addition to the TCC, monitoring for completeness and correctness of information drawn up and the timeliness of its issuance; development together with the TCC of schedules for the centralized acquisition of primary information and centralized transporting of the results of carrying out functions; providing methodological supervision on questions of introduction and functioning of the APCS at the plant and the organization of its expansion.

The organizational structure of the PID of the APCS is determined by its functions and is set up on the production-process principle. The functions are distributed between individual groups of the department according to the organization and the course taken by the information processing.

Vil'nyus TCC. The Vil'nyus TCC was intended for developing and servicing automatic control systems for cluster enterprises, developing and introducing control programs for machine tools with numerical programing control (NPC) at enterprises of the territory served and also in solving engineering problems on orders from scientific research, design and process-planning organizations of the USSR Ministry of Machine Tool and Tool Industry attached to the Vil'nyus cluster.

In the centralized development of control processes for machine tools with NPC, the Vil'nyus TCC services enterprises of all industries located in the Lithuanian, Latvian and Estonian SSRs and Kaliningrad Oblast of the RSFSR.

The Vil'nyus TCC also fills orders for the processing of economic information and operations associated with planning, algorithmization and programing.

Technological course of information processing. By the technological course of economic information processing is meant the process of information acquisition, reduction, processing, monitoring, reproduction-formating and transmission to the customer. Input information from the cluster plants arrive at the TCC in the form of machine carriers of information (punched tape and punched cards) and also in the form of teletype dispatches sent over communication channels or by direct input of information into computers.

The main variant of feeding input information is the first. The second is used only in exceptional cases, on agreement between customers and the TCC to which primary documents are sent, while machine carriers are built in the TCC. The third variant of feeding input information in the TCC over communication channels using peripherals will be carried out in the stage of further expansion of the APCS in the TCC. Thus, input information prepared in the PID of the APCS of the cluster plants is delivered to the TCC on punched tapes and punched cards.

The technological process in the TCC is subdivided into the processing of economic information from the cluster plants and the process of developing control programs for machine tools with NPC.

The technological processing of economic information of cluster plants in the Vil'nyus TCC is carried out as follows.

Machine carriers of information packed in special containers are picked up along a circular mail route by the TCC motor vehicles, are received, monitored and recorded in the TCC by the group for receiving, monitoring and releasing information. The functions are performed by the operators in the computer operations department in accordance with the schedule-plan for processing information of TCC customers; the results of the solution are filed and released by the group for receiving, monitoring and releasing information and are delivered to customers by the TCC motor vehicles.

Automation of the control of the technological processing of information in the TCC. For this purpose, a TCC automatic control system was developed and is now functioning; it organizes and automates these processes: collection, storage and processing of information on the activity of the TCC; handbook-information work; control of the TCC and its document turnover system; scheduling operations in the TCC; solving problems in optimizing the passage of functions in the TCC; simulating operations of the TCC at different stages; distributing and recording machine time (dispatcherizing) and so on.

The following principal documents are used in accumulating primary data in the system: variable and permanent data certificates of the problems solved, computer rating plate and the files of the variable data certificates of problems and computer rating plants. Also, use is made of record documents on the employment of TCC technical facilities.

Functions that can be handled after introduction of the first stage of the TCC automatic control system include:

1. Recording machine time and maintaining time budget accounts

2. Preparing report on the use of computer time for any interval of the current month

3. Preparing monthly and quarterly reports on the use of computer time at the TCC

4. Determining certain operating indicators of computers and use of computer time in the TCC over a year (computer useful time factor, computer repair factor and computer downtime characteristics)

5. Processing of daily data

6. Issuance of reports on the progress of problems in the TCC and on customers

7. Calculation of the cost of a man-day, norm-shift and machine-hour

8. Calculation of TCC profitability

9. Recording of equipment load in preparing machine carriers

10. Issuance of information on plan fulfillment

11. Task of setting priorities in problem processing on the computer

12. Function of setting up computer operating schedule

Organization of the planning and introduction of the APCS. Domestic and foreign experience shows that readying an enterprise to use computers and mathematical-economics methods takes 2 to 3 years. Use of computers and especially, the introduction of an APCS means a radical restructuring of the established methods of planning and control and requires preparation of all segments and services to operate under the new conditions.

Therefore, at plants where it is advantageous to use computers and APCS, special subdivisions are set up for conducting preparatory operations in upgrading the organization of manufacturing and introducing the projects developed.

In the designing of the AEMS Litstanok for five machine tool plants, the group designing method was adopted as the basis. Administratively (by order from the Glavtochstankoprom of the USSR Ministry of Machine Tool and Tool Industry), attached to each plant were individual subsystems for the preparation of project materials. This promoted the formation of special subdivisions at each plant--PID of the APCS. These measures permitted not only the fastest possible organizing and conducting of operations in surveying all plants, setting up the technical assignment for the designing and introduction of the AEMS Litstanok and developing the materials of the technical project (the plants had almost no share in the operational designing of the PID of the APCS), but also promoting the setting up of the core of the collective at each plant, but now with a grasp of both the designing elements and the structure of the whole system and the method of organizing the entire undertaking.

Laid on the collectives of the PID of the APCS of the plants was not merely the full burden of work in readying the plants for APCS introduction, but also their introduction into industrial service and ensuring the functioning of the APCS.

Since two organizations took part in the designing of the APCS and the TCC (Vil'nyus Planning and Design Office for Automatic Control Systems--in designing the APCS and the Vil'nyus branch of the ENIMS [Experimental Scientific Research Institute of Metal-Cutting Machine Tools]--in designing of the TCC); the introduction was conducted at five machine tool plants, while a methods council was formed for coordinating all operations in the designing and introduction of APCS and the TCC.

The methods council was formed by order of the USSR Ministry of Machine Tool and Tool Industry under supervision of the Vil'nyus branch of the ENIMS with the inclusion of representatives of the Vil'nyus Planning and Design Office for Automatic Control Systems and all five machine tool plants. The principal function of the methods council was coordinating operations and the methods supervision in designing, and particularly in the introduction and support of the functioning of the APCS. It must be assumed that with the further expansion of the AEMS Litstanok (after introduction of the first stage), the functions of the methods council will change in the direction of enlargement and the rights and possibilities of the methods council will grow.

To reduce the schedules for preparatory operations, the measurements in readying the plants for the introduction of the APCS were unified. The schedules of these measures were on a sliding basis, that is, all operations initially were conducted at the Komunaras and Zhal'giris plants and then in successive order at the remaining three plants, as well.

The measures in readying the plants for introduction of the APCS were conducted under a unified plan, developed and confirmed jointly with the developing organizations and the customer plants in this sequence: setting up the technical base; training and instructing plant specialists; organizing the standards base; organizing operations in the preparation and conduct of the experimental execution of functions; and organizing operations in preparing and transferring functions and the system into industrial use.

Execution of the above-mentioned measures began with the stage of preparation of the technical project and continued until the system was placed in service.

The following procedure in introducing the subsystems of the AEMS Litstanok at each plant was adopted: operations in introducing the systems of the HCP, CTU and RK; the rest of the subsystems are distributed in the following order: TES, CPQ, OCPM, CMTS and CTD.

During the experimental operation and transferring of the functions into industrial service, personnel were involved from services that directly were accountable for the functioning of the APCS.

It must be mentioned that the associations of expensive computing facilities (computers and other equipment) and human resources (highly qualified specialists) in the TCC are not only economically sound, but also methodologically

justified for the following reasons: acquisition (and operation) of the computers at each plant is economically unjustified and burdensome, since the mean load of a computer will be unbalanced and very low, while in the TCC the computer load can be adjuted and brought to the maximum level;

the TCC is becoming a methodological center in improving the control functions and further expansion of the AEMS at the cluster plants.

The annual economic benefit from the functioning of the AEMS Litstanok at the five machine tool plants is 1.1 million rubles with a recoupment time of one year.

In concluding, we should note that the level of knowledge of specialists and plant services heads is clearly not good enough and so the capabilities of the AEMS and the computers are far from fully tapped. In many higher educational institutions and in institutes for advanced training, specialists are graduating with a lack of competence to manage AEMS and computers.

It stands to reason that developing and introducing the AEMS Litstanok would be done much more effectively if a scientific-production association was set up on the basis of the above-mentioned plants and the Vil'nyus TCC.

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2 April 1976
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10123
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CONFERENCE ON QUESTIONS OF COMPUTER IMPLEMENTATION OF STATISTICAL INVESTIGATIONS OF TESTS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May/Jun 77 pp 141-142

[Article by M. M. Peshchak]

[Text] From 1 to 7 Feb 77, a conference on questions of computer implementation of statistical investigations of tests was held in the Institute of Linguistics, Ukrainian SSR Academy of Sciences. Participating in the conference were representatives from the Institute of Mathematics, Siberian Division, USSR Academy of Sciences; Institute of Cybernetics, Ukrainian SSR Academy of Sciences; Institute of Cybernetics, Georgian SSR Academy of Sciences; and Moscow State University.

The paper, "General Problems of Automating Editing-Publishing Operations" (O. G. Kosarev, Institute of Mathematics, Siberian Division, USSR Academy of Sciences), discussed algorithmic, economic and linguistic problems that arise in setting up the PARIS system (polnyy avtomatizirovannyy redaktsionno-izdatel'skiy servis [complete automated editing-publishing service]). It was noted that existing linguistic rules (syllabification rules, rules of orthography and so on) greatly impede the automation of editing-publishing operations and are in need of re-examination, with allowance for both technical and economic factors, and the most common schemes of visual perception of text (with and without partial reading aloud of text). Experimental arrangements were proposed for an objective evaluation of variants of rules and publishing norms (column format, letter configuration and so on); computer-oriented forms of dictionaries were discussed.

Analyzed in the paper, "R-Technology and Technological Complex of a Programer (RTK)" (I. V. Vel'bitskiy, Institute of Cybernetics, Ukrainian SSR Academy of Sciences), was the title technology developed by comparison with known programing methods--modular, structural, top-to-bottom and so on. The capabilities of the R-technology and means for automating it in text analysis, dictionary compilation and so on were discussed.

The paper, "Problems in Studying Correlations of the Structural Organization of Scientific Texts, Computer-Aided" (V. I. Perebeynos, L. M. Gridneva, T. A. Gryaznukhina, N. I. Zaplatkina, M. P. Muravitskaya, L. I. Komarova, V. I. Kritskaya and L. V. Orlova, Institute of Linguistics, Ukrainian SSR Academy of Sciences), proposed a scheme for computer analysis of scientific texts (automatic determination of classes and subclasses of words, distribution of morphological forms and categories, grammatical compatibility of verbs and nouns, structure of name chains and prepositional phrases, formal criteria for determining the functions of punctuation marks, statistical structure of texts at different language levels and grammatical and lexical means of linking sentences. The scheme is oriented toward computer realization with the aid of RTK and makes use of methods of statistical and structural analysis. Results of the analysis can be used as part of the linguistic support of automatic control systems, in automating editing-publishing operations and in solving problems of speech access of man to computers.

Outlined in the paper, "Systems Linguistics as a Way of Finding Correlations in Text Construction" (G. P. Mel'nikov, Moscow State University), is a scheme for organizing the communication cycle that can uncover relationships between performed and perceived units of language and thought content, expressed in the text by the units at different language levels. Based on this scheme, uncovering two levels of content units (definitions and thoughts) expressed in text helps in interpreting known statistical correlations detected in the text structure and helps solve a complex of problems tied in with automating editing-publishing operations.

The paper, "Predicting Frequency Structure of Lexicons from Sampled Data" (Yu. K. Orlov, Institute of Cybernetics, Georgian SSR Academy of Sciences), states the correlations of statistical structure found by the author; these correlations have not only theoretical importance, but also help in organizing the quantitative analysis of different kinds of information flows, in particular, they help in predicting the volumes and dynamics of growth in archives, data banks, computer dictionaries and so on. Developed methods of complete fixation of texts in linguistic-statistical analysis can aid in organizing automatic statistical scanning of large masses of texts needed in setting up information retrieval systems, automatic control systems and so on.

The paper, "Algorithm for Automatic Recognition of Grammatical Classes of Words" (T. A. Gryaznukhina and V. I. Kritskaya, Institute of Linguistics, Ukrainian SSR Academy of Sciences), dealt with the further expansion of the Belonogov algorithm; it can record 95-98 percent of homonyms in grammatical classes of words in the texts of cybernetics abstracts and in several instances can unambiguously determine the subclass (gender, number and case of noun and tense of verb).

Outlined in the paper, "Effective Methods of Investigating l-grams" (Yu. G. Kosarev, V. D. Gusev and T. N. Titkova, Institute of Mathematics, Siberian Division, USSR Academy of Sciences), are ways of getting a full spectrum

of the distribution of frequencies of text sequences (l-grams) for all values of l, when the solution time quasilinearly depends on text length, as well as a way of founding the boundaries of stable l-grams. This means there is a possibility of automating the eliciting of the clear in language and speech units in texts. Included is a wealth of clear material from the processing of political, scientific and literary texts; correlations found are discussed.

In the paper, "On Automatic Coding, Monitoring and Correcting of Texts with Restricted Dictionaries" (Yu. G. Kosarev and V. V. Khabarov, Institute of Mathematics, Siberian Division, USSR Academy of Sciences), are the results of an experiment on estimating the numerical and verbal forms of coding input information. Presented are objective estimates of coding clarity and redundancy from its effects on the labor productivity of encoder and punched-media operator and from the number of errors and the kinds of errors (semantic or syntactic). One finding is that in verbal coding, labor productivity doubles and nearly all errors become automatically detectable, while 80-90 percent are regularly correctible. Methods of automatic compilation of compact dictionaries based on R-language are described.

The conference resolution noted that the collectives represented at the conference are studying allied problem areas and that their findings to-date show that it is useful and valuable to move ahead systematically in the integrated treatment of problems in automating the analysis of aspects of text construction. Conference participants talked about an expansive problem area, "Linguistic and Algorithmic Problems in Automating Editing-Publishing Operations" and outlined the prospects of working together.

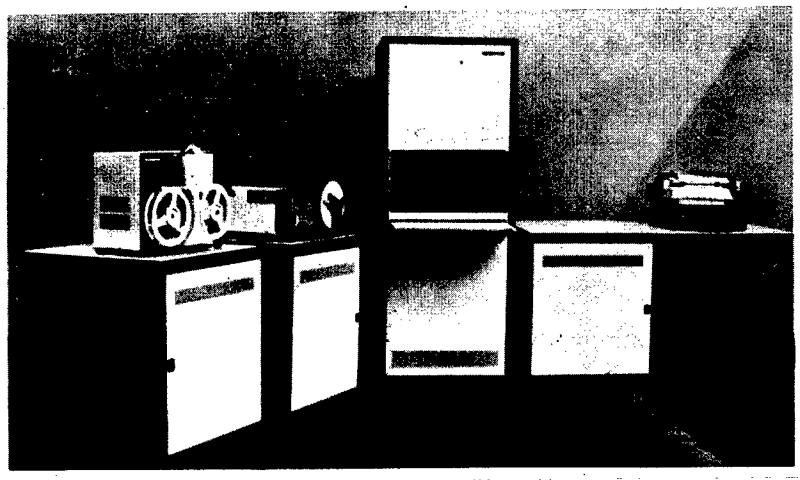
10123
CSO: 1870

SPECIFICATIONS OF M6000/M7000 ASVT-M COMPUTERS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May/Jun 77, end insert and inside back cover

[Data specifications on M6000/M7000 ASVT-M computers]

[Text] M6000/M7000 ASVT-M Computer

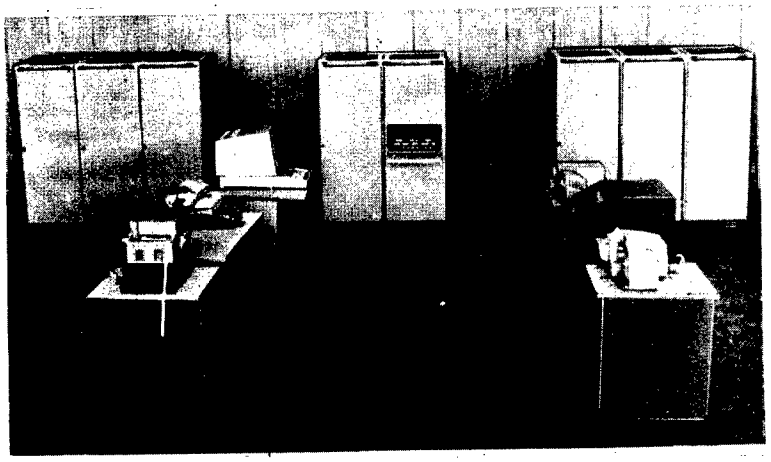


M7000

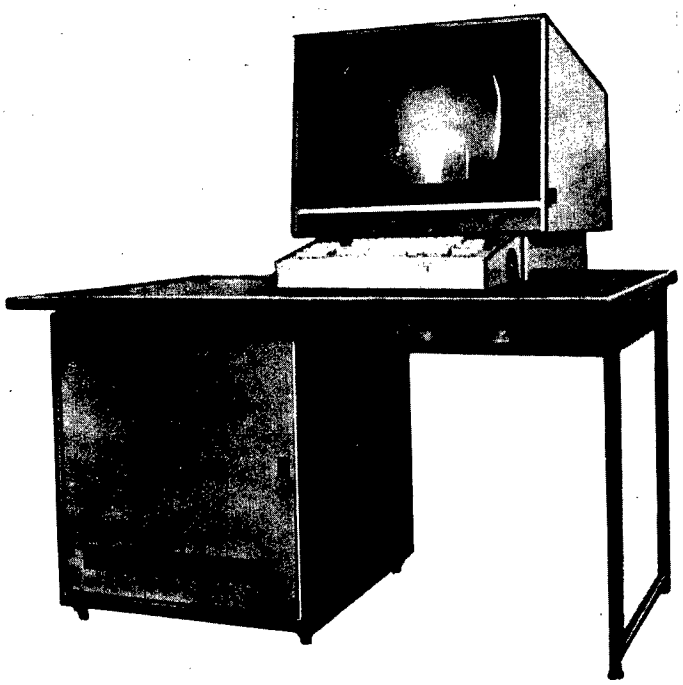
Main Technical Characteristics	M7000	M6000
Maximum size of operational memory, connected, 16-bit words	131,072	32,768
Operational memory cycle, microseconds	1.2	2.5
Maximum size of microprograming memory, words	2048 (with address register)	---
Bit capacity of microprograming memory	18 (with address register)	---
Cycle of microprograming memory, microseconds	0.625 (with address register)	---

[continued on next page]

Main Technical Characteristics [concluded]	M7000	M6000
Maximum number of connected units served by program or microprogram (excluding shift register, 2K)	56	54
Maximum number of direct access channels	2	2
Number of subchannels in each direct access channel	4	2
Maximum number of peripheral devices served by each direct access channel	48	4
Maximum rate of information transmission through the direct access channels, thousands of words/sec	340	400
Operation execution time, microseconds:		
addition (memory--register without indirect addressing)	2.5	5.0
multiplication	29 (without address register)	43
division	32 (without address register)	57
	18 (with address register)	---



M6000



A532-1 GRAPHICAL DATA DISPLAY STATION

Provides screen display of alphanumeric symbols and graphical images made up of dots and segments of lines and arcs of circles, input of alphanumeric information and special characters from keyboard and marking of image elements on screen with a light pen.

Main Technical Characteristics

Dimensions of working field of screen, cm	24x24
Resolving power, picture elements	1024x1024
Time for processing a line segment, microseconds	6; 15; 25 (depending on segment length)
Time for processing a symbol, microseconds	1-11
Maximum number of symbols on screen	2000
Number of brightness gradations	2
Normal level of maximum brightness, nits	100±10

Processing of symbols, dots and solid and dashed line segments and arcs is done by the device based on control and information words that it is fed. Buffer memory is not part of the device, that is, images are regenerated with the required frequency only with the processor to which the device is interfaced.

M6000/M7000 ASVT-M Computers

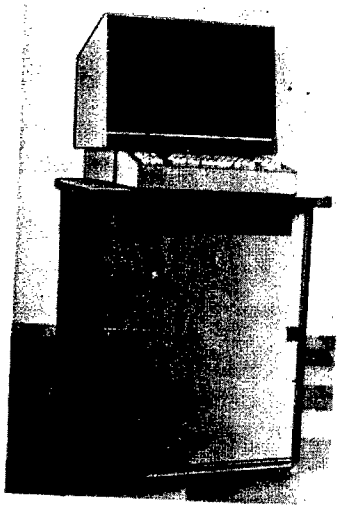
Display modules DM-500, SID-1000 and DM-2000 are intended for operational exchange of alphanumeric information of man with computer complex

Display modules DM-500 and DM-2000 are the basis for the layout of video terminals of various configurations and purposes.

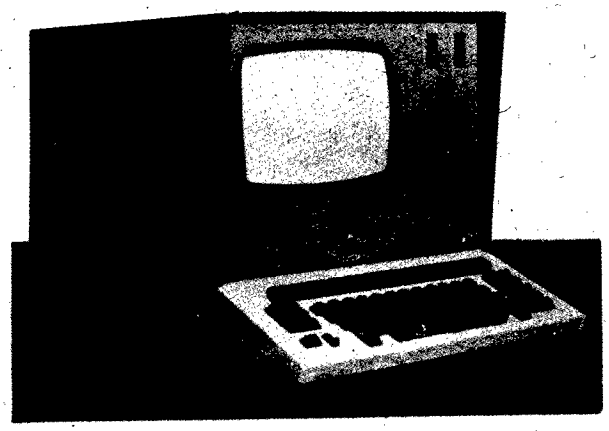
DM-2000

Main Technical Characteristics	DM-500	SID-1000	DM-2000
Type of cathode-ray tube	23LK13B	35LK65	40LKZB
Screen capacity, characters	512	1024	1920
Number of lines	16	16	24
Number of characters in line	32	64	80
Character generator	Ferrite core read-only memory		
Principle of character formation on screen	Point microraster 5x7 points using standard video raster	Line microraster	Same as for DM-500
Character sign, mm	4x3	4x2.4	4x3
Buffer memory type	Quasistatic MOS microregisters	Magnetostrictive delay line	Same as for DM-500

Main Technical Characteristics [concluded]	DM-500	SID-1000	DM-2000
Capacity of buffer memory, bytes	512	1024	1920
Rate of data exchange with computer, characters/sec	0-30,000	0-500	0-30,000
Type of interfacing	2K	2K	2K
Editing functions	6	6	11



DM-500



SID-1000

10123
CSO: 1870

WORK PROGRESSES IN DEVELOPING AUTOMATED PLANNING CALCULATIONS SYSTEM

Assorted General, Specific Development Tasks

Moscow EKONOMIKA NEFTYANOY PROMYSHLENNOSTI in Russian No 5, 1977 pp 39-40

[Annotation and abstracts of articles]

[Text] Annotation

Since mid-1974 the sector has been developing a sectorial automated system for planning calculations (ASPR) called Neftedobycha. It encompasses three levels of administration: USSR Gosplan (sector) -- the Ministry -- the association (enterprise).

In 1975 the contract design was done for the system encompassing the level USSR Gosplan -- the Ministry; detailed designing is now under way for this part of the system.

In 1976 contract and detailed design work was begun on an ASPR for a petroleum and gas extracting association. A model design is being worked out and, according to plans, will be introduced on an experimental basis at the Kuybyshevneft' Association in late 1978.

The Ministry of the Petroleum Industry held a seminar in Anapa from 30 August to 5 September 1976 to draw the attention of executives from the association economic services (users) and KIVTs [group information and computing centers] (operators) to this development. Participants at the seminar, put on by the economic planning administration of the Ministry, included employees of USSR Gosplan, the Ministry's Technical Administration, and its Main Information and Computing Center, executives of association economic services (deputy general directors for economics and chiefs of economic planning divisions), executives of association KIVTs's (directors and their deputies), and specialists from VNIIOENG [All-Union Scientific Research Institute of the Organization, Management, and Economics of the Petroleum and Gas Industry].

Issues Nos 5 and 6 will present material on the problem of developing and introducing a sectorial automated system of planning calculations at a petroleum extracting association.

Abstracts of Articles Published in the RNES [Reference Scientific-Economic Collection] EKONOMIKA NEFTYANOY PROMYSHLENNOSTI No 5, 1977

UDC 622.323:65.85

Grayfer, V. I., and Simonov, Yu. B., "Methodological Questions of the Development of the Sectorial Subsystem ASPR Neftedobycha."

This artice describes the structure and content of the sectorial subsystem ASPR Neftedobycha and the challenges that face it. The indices that are claculated in the blocks are enumerated and their interrelationships are demonstrated. This interdependence insures the unity of the system and of the data base and software. The basic principles and structure of the ASPR software are given. The state of work on development of the sectorial subsystem of the ASPR Neftedobycha at the end of 1976 is described.

UDC 622.323:65.85

Soskov, V. F., and Urinson, Ya. M., "Preliminary Design of the ASPR with Respect to the Principles of the System's Design and Functioning."

This article elucidates the content of the preliminary design of the ASPR which determines fundamental decisions regarding design, introduction by stages, and the functioning of the ASPR overall and of its supporting subsystems.

UDC 622.323:65.85

Rynskiy, O. M., "Automation of Economic Planning Calculations -- a Key Area of Work in the Automated Control System for Petroleum."

This article elucidates the stages of work on automation of economic planning calculations in the period 1969-1977. The methodological and design principles of the system's construction are analyzed. Experience with introduction of the first phase of the ASPR at the Ministry and the subsystems for current and future planning in the ASU's [automated control systems] of the associations Tatneft' [Tatar ASSR Petroleum], Azneft' [Azerbaydzhanian SSR Petroleum], and others is generalized. The main lines of development of the ASPR as a system with potential for future planning and the like are defined.

UDC 622.323:65.85

Gal'person, Ye. B., Papeyev, V. M., and Sklyarenko, V. Ye., "Principles of the Development of the Production Program in the Subsystem ASPR Neftedobycha."

This article elucidates the principles and criteria which formed the basis for development of the "Production" block, which is a part of the subsystem ASPR Neftedobycha. The functioning of the block results in formulation of a production program whose primary indices, when sent to

other, adjacent blocks, makes it possible to calculate a set of technical and economic indices that characterize the activities of the sector in the near future.

UDC 622.323:65.85

Barinshteyn, B. A., Luk'yanov, A. S., and Eskin, V. I., "Methodology for Distributing Volumes of Petroleum Extraction and Operational Drilling by Planning Units."

This article proposes a mathematical model of a petroleum extracting association that makes it possible to forecast the expected extraction of petroleum for a year with given expenditures. The model is a system of conventional linear differential equations with constant coefficients constructed on the basis of hydrodynamic ratios. Some physical parameters that are coefficients inthe system of differential equations are not known a priori; they are determined from data of measurements of petroleum extraction, liquid extraction, and liquid extraction at new wells. Meaningful statements of the problem are given for optimal distribution of resources for petroleum extraction among extraction units in indeterminate conditions.

UDC [622.323+622.24]:658.152

Marshayeva, F. V., and Faddeyev, V. P., "Basic Principles for Development of the Capital Investment Plan."

This article summarizes experience with development of the block "Capital Construction" of the ASPR Neftedobycha with respect to the goals and problems of creating a sectorial sybsystem for planning calculations. It describes the difficulties in constructing an ASPR and tells ways to overcome them as well as citing areas for further refinement of the system of calculations and correct use of them.

UDC 622.323:65.85

Chernogorskiy, A. M., Gurevich, Ya. D., and Chernyak, M. I., "Basic Principles for Development of the Labor Indices Plan."

This article sets forth the basic principles used in constructing the automated system of planning calculations of labor indices. The need is demonstrated to use simulation of the activities of the planning worker in modeling the process of compiling a plan according to labor indices. The production association was selected as the object for which a scheme of direct planning calculation is constructed. The personnel of the association are broken down into 15 groups that are homogeneous from the point of view of the calculations. Labor planning indices are calculated for each group and then the indices are reduced according to a set of given characteristics. Ways are pointed out to achieve further improvements in the methodology of automated calculation of labor planning indices.

UDC 622.323:65.85

Dreysin, A. G., and Alekperova, T. P., "Basic Design Decisions on the Functioning of the 'Material-Technical Supply' Block of the ASPR Neftedobycha."

This article reviews the purpose and functions of the block and its data linkages with other blocks of the sectorial subsystem ASPR Neftedobycha. There is a description of the nine planning calculations included in the priority set which defines the need for the scarcer norm-controlled material-technical supplies (casing, drilling, and pump-compressor pipe, soda ash and caustic soda, plugging cement, drilling rigs, centrifugal and electrical submersion pumps). A description is given of the constituents of the formulas for calculating the need for each type of material and equipment under review, showing the initial indices used for the production association and the Ministry. The goal and method of solving problems of analyzing the planning indices of development used in the block are also treated.

UDC 622.323:331.876

"Results of Socialist Competition Among Komsomol-Youth Collectives at Enterprises and Organizations of the Ministry of the Petroleum Industry for 1976."

This article names the winners in the 1976 socialist competition among Komsomol-youth collectives in the petroleum industry. They won challenge Red Banners and received the title "Best Komsomol-Youth Brigade of the Ministry of the Petroleum Industry" as well as money prizes.

Further Aspects of ASPR Development

Moscow EKONOMIKA NEFTYANOY PROMYSHLENNOSTI in Russian No 6, 1977 pp 41-42

[Abstracts of articles]

[Text] Abstracts of Articles Published in the RNES EKONOMIKA NEFTYANOY PROMYSHLENNOSTI No 6, 1977

UDC 622.323:65.85

Ryazanova, N. I., and Krylova, N. A., "Basic Design Decisions in Development of the Block 'Prime Cost, Profit, and Profitability.'"

This article elucidates questions of formalizing the set of calculations related to determination of prime cost, profit, and profitability under conditions of an automated system for planning calculations (the ASPR Neftedobycha). The formation of the prime cost of the market output of the petroleum extraction sector is considered in two directions: through the elements of expenditures and the influence of technical-economic factors.

UDC 622.323:65.85

Dreysin, A. G., and Lishanski , A. S., "Basic Principles for Constructing the Data Base of the ASPR Neftedobycha."

This article reviews the purpose, organization, and functions of the data base of the ASPR Neftedobycha. The advantages achieved through the functioning of this base are pointed out. There is a classification of technical-economic information in the data base by composition and economic content, operationality of updating, place of formation, and media. Definitions are given of the arrays of planning, report, and normative data, principles of shaping them, and the input, preparatory, intermediate, and output data. The features that characterize the composition of the indices are noted. The types and purposes of documents used in the data base of the ASPR Neftedobycha are pointed out. The principle of functioning of the data base is noted.

UDC 622.323:65.85

Ashkinuze, V. G., Lishanskiy, A. S., Reznikovskiy, P. T., Frants, Yu. I., and Vernikovskiy, V. V., "One Approach to Creating the Software of the ASPR Neftedobycha."

This article reviews the principles of drawing up software for an ASPR built by breaking the technological process down into autonomous processes: "Data Input," "Storage and Access," "Making Calculations," "Output of Results," and "System Control." It is demonstrated that model decisions on designing such processes make it possible to significantly reduce the labor-intensiveness and design time for a software system. The software system is oriented to the use of third generation computers.

UDC 622.323:65.85

Vadyaskin, Yu. Ye., Vartanov, S. P., Kamenetskiy, S. G., and Potapov, B. I., "Structure of the Software of the ASPR Neftedobycha."

This article reviews questions of the development of software for the ASPR Neftedobycha. The data bank of the ASPR Neftedobycha is a set of arrays each of which is designated to perform specific functions: the archive array, the working array, libraries and questionnaires of users, the array of formulas, and so on. Reference links are organized among the arrays.

The proposed approach to constructing software makes it possible to greatly reduce the loading of operational memory on disks without an appreciable increase in time required to perform an assignment, assure potential for extensive modernization of the system of calculations and generation of output documents, and allow the user to take an active part in the iterative process of plan development.

UDC 622.323.:65.85

Balasanov, V. A., Vadyaskin, Yu. Ye., Yegorov, N. G., Yershov, A. S., and Potapov, B. I., "Realization of the ASPR Neftedobycha Data Bank."

This article reviews the basic questions of detailed design of a sectorial subsystem, specifically the ASPR Neftedobycha, from the point of view of designing and realizing data structures. A description is given of the structure of the data bank of this subsystem and the basic functions of its components are defined. Solutions are proposed for a number of methodological questions of programming an intricate automated system that generates an information system from a certain deterministic class of systems.

UDC 622.323:65.85

German, V. T., Gol'din, A. K., Larin, N. V., Simonov, Yu. B., Pozhilov, Yu. F., Chuykin, Yu. N., and Tsybul'skiy, G. P., "Questions of Designing the ASPR at a Petroleum and Gas Extraction Association (an ASPR NGDO)."

This article sets forth the structure and content of an ASPR NGDO. It is demonstrated that the ASPR NGDO, as a part of the sectorial subsystem ASPR Neftedobycha and at the same time a component part of the ASU-Neft' [Petroleum Automated Control System], is aimed at further refinement of planning methodology and organization. The projected functional structure of the ASPR is given and the basic problems resolved in the blocks of the system are defined. The enterprises and associations for whom the ASPR is mainly being developed are mentioned and the modes in which the system functions are pointed out.

The basic areas of economic efficiency in the ASPR NGDO are named.

UDC 622.323:65.85

Akimov, V. F., Styrikovich, R. S., Kazakova, V. V., and Mayorova, T. A., "Study of the Precision of Calculation of Certain Indices of the Current Plan of the Petroleum Industry."

This article poses the problem of evaluating the precision of the output indices of an automated system as a function of the precision of the raw data. A study was made for technical-economic substantiation of a petroleum extraction plan on the medium-term (annual) planning level using statistical material for the period 1968-1975. An analysis is given of the comparative influence of errors in raw indices on the precision of the result.

UDC 622.323:65.85

Khamidullin, N. Kh., Darzemanov, V. G., and Valikhanova, A. M., "Experience and Problems of Introducing Economic Planning Calculations in the ASU-Neft' System with the New Organizational Structure."

This article elucidates experience in using mathematical methods and modern computer equipment to solve economic planning problems at the Tatneft' Association under the conditions of the new organizational structure. There is a list of the problems solved by computers with a short description of their content. The basic lines of actions and challenges of the Tenth Five-Year Plan in the area of further improvement of work involving computers are outlined.

11,176
CSO: 1870

ROAD MACHINERY PLANTS IMPLEMENT ENTERPRISE AUTOMATED CONTROL SYSTEMS

Moscow STROITEL'NYYE I DOROZHNYYE MASHINY in Russian No 4, 1977 pp 28-30

[Article by B. G. Volk, candidate of technical sciences, Kiev Stroydormash Plant,V. P. Solov'yev, engineer, VPO Soyuzdormash, and A. A. Budko, engineer, Kremenchug Dormashina Production Association: "Experience in Applying an ASU at Road Machinery Building Plants"]

[Text] The document "Basic Directions of Development of the USSR National Economy for 1976-1980" which was adopted by the 25th CPSU Congress envisioned "Further development and increased efficiency of automated control systems and computing centers."

Automated enterprise control systems (ASUP's) are now operating at the following plants of VPO [All-Union Production Association] Soyuzdormash: the Kremenchug Order of the Labor Red Banner Road Machinery Plant (at the design level); the Kiev Stroydormash Plant imeni 50-Letiya Sovetskoy Ukrainy (first stage); the Chelyabinsk Order of Lenin Road Machinery Plant imeni Kolyushchenko (at the design level); the Bryansk Order of Lenin Road Machinery Plant imeni 50-Letiya Velikogo Oktyabrya (first stage). The economic effect of introducing these systems is 1,355,000 rubles. The plants are medium-sized and large enterprises with small-series and series production.

The hardware of the ASUP's at plants of VPO Soyuzdormash is based on second-generation Minsk computers and punched card equipment included in the make-up of information and computing centers as well as existing machine accounting stations (see Table 1, next page). The set of problems handled in the ASUP can be described with the example of the Kremenchug Road Machinery Plant (see Figure 1, next page) where the ASUP does 76 jobs in six functional subsystems and produces 143 types of output forms. The form of data representation is differentiated by levels of administration and uses computer equipment to support the following: annual, quarterly, and monthly production planning; operational records of the primary indices of the production and economic activity of all subdivisions; operational control of the course of primary production;

Table 1. Description of ASUP Hardware

Equipment	Kremenchug Association	Kiev Plant	Chelyabinsk Plant	Bryansk Plant
Minsk-22 Computers	1	-	1	-
Minsk-32 Computers	2*	2*	-	1
Punched Card Equipment, Sets	3	2	2	3
Peripheral Equipment, units	6 (RP-50)	30 (manual punches)	-	2 (RP-100), 22 (RP-50), 2 (RP-10)

* Expanded set

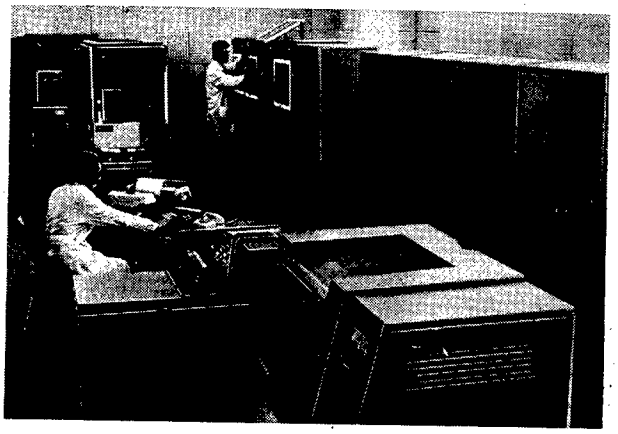


Figure 1. General Appearance of the Machine Room at the ASUP of the Kremenchug Road Machinery Plant.

raising the productivity of management and engineer labor; sharply reducing unproductive losses; reducing the growth rate of management personnel.

A uniform complex of design, technological, and organizational activities to establish and maintain precise production conditions of operation is secured by systematic handling of problems for these subsystems: technical preparation for production; operational control of production; control of material-technical supply; technical-economic planning; bookkeeping; sociological research and organization of management.

The jobs of the subsystem for technical preparation for production are: calculating the parts composition and making up technical documents, the Applicability Statement and notices of change; calculating the specified and summary norms of materials expenditure by part; standardization evaluation of parts; automation of normative calculation of materials used for tools and production outfitting.

The subsystem for operational control of production (OUP) handles the following set of jobs: continuous operational production planning with delivery of by-part plans to production sections and shifts; operational production planning of articles in small-series and experimental production in machine-sets; monitoring the course of primary production; calculating indices of plan fulfillment by shops and the whole plant.

The subsystem for material-technical supply supports planning for material-technical supply and records of the use of material resources.

The subsystem for technical-economic planning covers questions of the calculation of planning and economic indices of enterprise work.

The bookkeeping subsystem represents automation of wages calculations and calculation of expenditure of material resources and accounting of enterprise fixed capital, special tools, and other material assets.

The subsystem for sociological research and organization of management solves the set of problems associated with sociological study of the association collective and monitoring the performance discipline of association executives.

The functioning of the ASUP involves processing, accumulating, and storing large volumes of information, changing the system of documentation and document circulation, centralizing reference and standards data to meet the requirements of comprehensive data processing. A revision of design, production engineering, and planning-accounting documents has been carried out at the association on the basis of existing All-Union State Standards and original solutions have been found in creating conditions for the use of all these documents in the ASUP. The problems of coding technical-economic data with an orientation to a uniform classification system without the use of intermediate and supplementary documents have been solved.

Forty-nine classifiers of technical and economic planning information have been developed, including classifiers of parts, materials, assembly components, finished products, technological operations, equipment, tools, occupations, and so on. The classifiers were worked out on the basis of the highest classification groupings of the all-Union classifier of output (VGK OKP) and insure output to the sectorial ASU. Of the total volume of system jobs in the classification 63 percent have been recommended as model planning solutions for enterprises of the Ministry.

The system is based on modular construction of jobs (problems), making it possible to plug original solutions into the computing complex and to replace individual modules, thus making certain nonstandard conversions. This allows broad application of solutions to problems and building up, as necessary, a library of model planning solutions (TPR's) which, in turn, permits continuous refinement of the system itself.

The solutions to problems of organization of production management are based on the use of a norm system on machine media including roughly 1 million different reference-normative data. The primary data arrays are standards of direct applicability with production routes, by-operation labor standards for each part and assembly unit, materials standards for each part and assembly, price list wholesale prices for materials, purchased articles, and finished products, reference data on the names of parts, assemblies, materials, purchased parts, and the like.

Operational planning occupies a central place in enterprise management, and therefore the subsystem for operation management of production (OUP) coordinates the activities of the primary production subdivisions.

At the Soyuzdormash plants which are introducing automation of control the development of ASUP's has been based on a system of continuous operational planning following the method of the Novocherkassk Electric Engine Building Plant (NEVZ). Considering completeness of coverage of management functions, the OUP subsystem of the Kremenchug Road Machinery Plant was selected for copying (see Figure 2 below). The subsystem encompasses both intershop and intrashop planning and records as well as operational monitoring of the course of production.

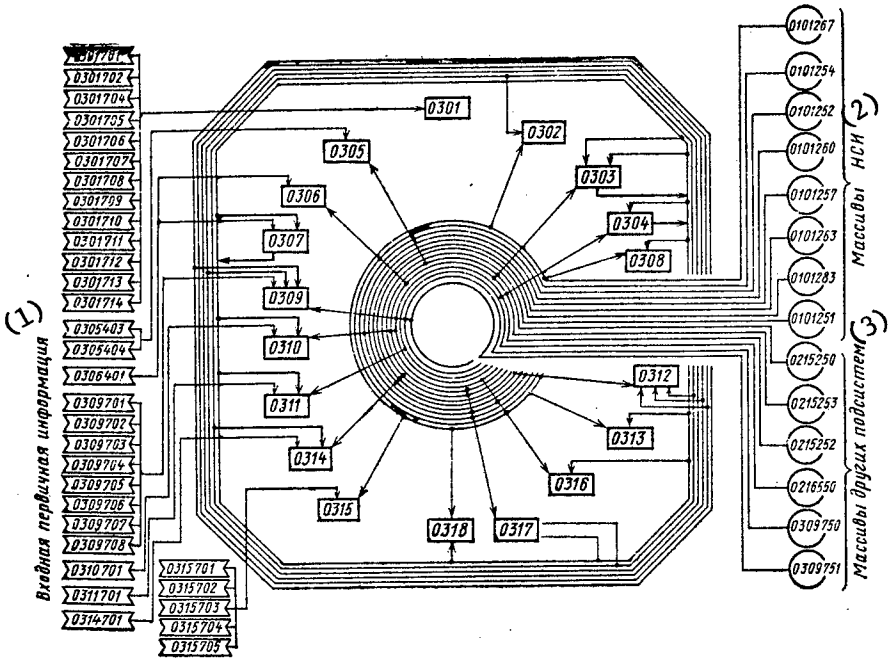


Figure 2. Diagram of Data Coordination of Problems of the OUP Subsystem

Key: (1) Primary Input Data;
(2) Arrays of Reference Standards Data;
(3) Arrays of Other Subsystems.

The primary document for recording the movement of production objects is the plan-card, a multiple-use document which circulates for up to a year.

Table 2 (next page) gives a description of the problems of the OUP subsystem represented in Figure 2 (above).

The organizational structure of management at the Kremenchug Road Machinery Plant was studied and partially modified in connection with introduction of the ASUP. As a result regulations were worked out on

Table 2. List of Problems of the OUP Subsystem

Number of Problem (ref. Figure 2)	Designation
	Input Operational Data
0301701-0301714	Information on movement of objects of production
0305403-0315705	Planning assignments, fulfillment of shift assignments, equipment downtime
	Operational Data
0301	Collection and initial processing of operational information on movement of production objects in form of codograms on machine media
0302	Recording movement of parts for purposes of operational management (shaping the operations array, recording shop and intershop movement of parts with the numbers of the day-sets)
0303	Recording defective goods
0304	Balance of parts movement
0305	Calculation of parts needs for planning period
0306	Calculation of tentative number of parts for a day-set and calculation of the standard backlog for each part
0307	Conversion of the current number of the day-set for each part and redetermination by shops and sections
0308	Daily calculation of the order of launching batches of parts
0309	Calculation of the shift and daily assignments for the primary shops
0310	Determination of completeness of supply to assembly shops and identification of parts subject to immediate delivery for assembly
0311	Analysis of fulfillment of the primary production plan by shops
0312	Analysis (report) of fulfillment of the primary production plan for the day and from the start of the month in value terms and percentage for the shops and the plant
0313	Statement on state of production (coefficients of complete supply for each part and shop)
0314	Record of fulfillment of the metallurgical plan by the casting shop
0315	Record of downtime of production equipment by cause and party at fault
0316	Questions of the production-control service of the plant and the shops. Drawing up the schedule for the month with breakdown into 10-day periods with due regard for actual number of day-set

0317	Calculation and estimate of incomplete production
0318	Record of fulfillment of the plan for shop turnover of series-produced spare parts

Reference Standards Data

0101251 0101252 0101254 0101257 0101260 0101263 0101267 0101283	Labor and Materials standards. References of names of parts and equipments. Price lists.

Arrays of Other Subsystems

0215250	Technical-economic planning (TEP) analytic supply log for the plant
0215252	TEP supply log of parts assembly for the shop
0215253	TEP routes of parts and assembly units
0216650	TEP wholesale prices for parts and assembly units
0309750	Availability of materials in the shop
0309751	Number of machine tools by groups

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the primary divisions of the enterprise. They set forth the basic functions of the enterprise management, gave their affiliation and subordination, defined their goals, rights, and responsibility, and gave a clear idea of the functions of structural elements of the plant and straightened out the distribution of obligations, rights, and responsibilities under ASUP conditions.

In working out these regulations a special place was given to the system of linkages and relationships which was expected to insure a combination of the goals of the structural subdivisions with the goals of the production units and the plant as a whole, unity of leadership, and proper information support for every structural subdivision.

The ASUP's of the other enterprises of VPO Soyuzdormash resolve these problems in different ways. We should particularly note a few special features of the ASUP at the Kiev Stroydormash Plant.

Four magnetic drums have been included in the hardware there for storing the library of programs and assembling and loading them. The data base uses a "listing" impersonalized coding system that allows them to avoid classifiers and reduce the length of the codes. The subsystem for technical preparation for production includes a series of problems concerned with strength calculations of the metal design elements of earthmoving and transportation machinery, including a calculation of pulsed (shock) loads.

The OUP subsystem uses a punched card-invoice as its primary input document; it is prepared at the shop peripheral point using a manual punch designed at NEVZ. The systemwide software uses elements of the operations system, control programs of the Monitor type that allow batch processing of problems and automation of operator labor.

During the current five-year plan ASUP's are developing along the path of refinement of problems already being handled and expanding the spheres covered by automated control. The next problems, planned for introduction in 1977, are calculating the shift-daily assignment (the Kremenchug Road Machinery Plant and Kiev Stroydormash) and introduction of the model bookkeeping subsystem with computer data processing (the Kiev Stroydormash Plant).

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OVERVIEW OF ASU DEVELOPMENTS IN UZBEKISTAN, PROGRESS, PROBLEMS

Tashkent EKONOMIKA I ZHIZN' in Russian No 6, 1977 pp 83-86

[Article by I. Perlov, candidate of economic sciences, head of the division for coordination of information-computing centers of Uzbek SSR Gosplan: "The ASU -- Its Use and Return"]

[Text] In the field of designing and developing ASU's [automated control systems] in the republic today issues of efficiency are becoming paramount. The period of establishment and growth is basically ended. All our large ministries and departments have computing centers, 82 ASU's have been introduced, high-powered specialized planning organizations for development of all types of ASU's are functioning, and cadres with higher and secondary specialized education are being trained.

The overall results of the Ninth Five-Year Plan and the first year of the current plan show that where jobs are correctly organized ASU's have a tangible effect and become an inalienable part of the operations of ministries, departments, and enterprises.

For example, the economic effect from introduction of the sectorial ASU of the Uzbek SSR Ministry of Power and Electrification (the first among the country's power systems) is 1 million rubles a year and the payback period for expenditures is 2.5 years. The system was exhibited at the Exhibition of the Achievements of the USSR National Economy and received a gold medal. The journal EKONOMIKA I ZHIZN' has carried detailed stories about it earlier.

The first phase of the ASU of the Central Asian Railroad includes 27 tasks. The economic effect from its introduction is 915,000 rubles and the payback period is 2.1 years. The road's computing center figures monthly shipping plans and reduces inefficient counter, repeated, and short runs to a minimum. All commercial data, even including copying documents for the bank, for the Tashkent and Khavast sections of the road are processed by computer. The problem of coordinating passenger locomotive brigades has been solved optimally, which minimizes their delay time at change points waiting for necessary trains ; reserve brigade trains are also minimized. The computing center's place in

the work of the road is irreversible; it is no longer possible to bring back the operations which were performed manually before being turned over to computers.

Work on the ASU in the Uzbek SSR Ministry of the Building Materials Industry began in 1973. In this time a sectorial ASU with 95 tasks has been developed and introduced. This automated system has realized optimization problems for choosing building materials shipping routes and connecting suppliers to consumers. A no-application system of material-technical supply is carried on by computer. After the plan is ratified the computer, based on carefully worked out norms, calculates materials requirements for primary production, repair and operating needs, and so on.

Before the ASU was launched the ministry had constant disputes with construction departments about deliveries; the reason was imprecise information. Today the information-computing center supplies the ministry with daily information on shipment of building materials broken down by associations, enterprises, railroad stations, and customers and goes as far as decoding individual schedule-orders.

In 1976 the ASUP [automated enterprise control system] of the Santekhlit Plant in Akhangaran began operations. The plant does not have its own computer; all data are processed in Tashkent, at the ministry information-computing center, and sent to the plant in Akhangaran each day by telegraph. Thus, work has begun to convert the ministry information-computing center into a collective-use center. The sectorial ASU of the Uzbek Ministry of the Building Materials Industry was exhibited at the Exhibition of the Achievements of the USSR National Economy in 1976 and received a diploma second degree.

The republic computing center of the Uzbek SSR Main Administration of Supply and the Central Scientific Research Institute of Material-Technical Supply of USSR Gossnab have developed an ASU for supply of chemical and industrial rubber goods to the republic. Computers are used to define the need for 15,000 types of products, optimize links between suppliers and consumers, and calculate standard stocks. Computers write out some 300,000 schedule-orders a year. The economic effect in the supply system (that is, not considering the benefit to customers) is 48,000 rubles a year. This development has been adopted by USSR Gossnab for introduction in other republics.

In the Uzbek SSR Ministry of Health the computer is used efficiently to solve problems in diagnosis of gastrointestinal illnesses, optimal irradiation of tumors, and treating oncological illnesses. The exceptionally important problem of analyzing the use of available beds has been solved. The computer calculates the workload of specialized and multipurpose medical institutions broken down by oblasts, cities, and for the republic as a whole.

Home-building combine No 1 of Glavtashkentstroy [possibly Main Administration for Construction in Tashkent] uses computers for operational control of the production of prefabricated reinforced concrete and insuring complete supply of articles for installation; a number of technical-economic planning problems have also been computerized. Each day the combine's computing center sends out information on production of finished output and state of supply by sites. A no-application system of wage payment has been introduced: based on output turned in to the warehouse the computer, in conformity with output quotas and wage rates, makes a daily calculation of wages by shops in primary production. Knowing their daily earnings has a great stimulating effect on workers. Further elaboration of this system proposes setting up a no-advance system of wage payment (for the half-month one receives exactly what one has earned). The economic effect received since the ASU was introduced at the combine (since 1973) is 200,000 rubles.

The ASUP's of the Tashkent Aviation Production Association and the Tashsel'mash [farm machinery] and Tashkentkabel' [cable] plants cover the production process from delivery of raw materials to production of the finished product. The annual economic effects from introduction of these ASUP's are 1,328,000 rubles, 519,000 rubles, and 345,000 rubles respectively and the payback periods are less than three years.

In many ministries and departments of the republic, however, there are serious shortcomings in the organization of work on setting up ASU's and use of state capital for this purpose. There are cases where ASU's launched earlier are not operating at full capacity, and some are not operating at all.

Thus, in 1973 the republic Ministry of Agriculture accepted for use the ASU of the Tashoblsel'stroy [Tashkentskaya Oblast Rural Construction] Trust, then in 1974 also accepted an ASU for Trust No 23 in Tashkent. The designers were paid 100,000 rubles, but industrial operation of the systems has still not been straightened out, even though the ministry has a computing center where a Minsk-32 machine has been in operation since 1973. In 1975 the ministry failed to fulfill its assignment for introduction of an ASU at Trust No 12 (Nukus).

There has been no return on the first phase of the sectorial ASU of the Uzbek SSR Ministry of Agriculture, which was launched in 1975. This ministry has had the lowest indices in the republic for computer use for several years now.

In the republic Ministry of the Meat and Dairy Industry system ASU's were introduced in 1975 at the Tashkent Meat Combine and the Tashkent Dairy Combine. Expenditures for development of these systems were 186,600 and 179,700 rubles respectively. But an inspection made by Uzbek SSR Gosplan showed that the systems are not operating at full capacity. For example, only two of the 11 ASU tasks are working at the meat combine. An expensive, modern YeS-1020 computer has been stored in boxes for a year at this ministry owing to lack of space.

An ASU based on the Komplekt program package was introduced in 1972 at the Uzbekshakhtostroy [Uzbek Mine Construction] Trust of the republic Ministry of Construction. But the head institute for ASU's of the USSR Ministry of Construction had published a survey of automated systems being introduced in construction which did not recommend the Komplekt package owing to its imperfections. The head institute proved right; the system did not work. But 233,000 rubles were spent developing it.

The people at the trust failed to draw the proper conclusions from this. In 1974 development of a new system, the Komplekt-3, was begun. By the start of 1977 design expenditures had reached 120,000 rubles but things had not advanced beyond the stage of isolated experiments.

Unfortunately, ASU design work is still expensive throughout the country: expenditures to design enterprise ASU's are 150,000-250,000 rubles, and for republic sectorial ASU's costs run 300,000-500,000 rubles.

These amounts show a stable trend toward decrease. Unfortunately, though, there are also cases where the opposite is true.

According to the contract with the designers, design work for the sectorial ASU of the Uzbek SSR Ministry of the Food Industry was supposed to cost 800,000 rubles. In 1975 some of this ministry's enterprises were transferred to the newly formed Uzplodoovoshchvinprom [Uzbek Fruit, Vegetable, and Grape Industry] Association and the number of tasks in the ASU decreased from 57 to 22. But the cost of developing the design of the ministry's sectorial ASU did not change, which means it actually rose.

The role and responsibility of the ministries, departments, and enterprises to insure internal checks on the expenditure and efficient use of capital for development of ASU designs are rising greatly today.

The designing of an ASU differs in specific ways from the designing of enterprises and other structures. In designing enterprises, of course, capital investment is the source of financing. Each year lists of design and surveying projects are ratified as part of the national economic plan and Stroybank finances these projects within the limits of the established amounts and times. Thus, outside checks on the expenditure of state capital are exercised in this case by planning and financial agencies.

Things are different with ASU designing. According to existing regulations, this work is basically done and financed through the prime cost of industrial output and the enterprises and organizations themselves are given the right to dispose of capital for this purpose, byapssing Gosbank and Stroybank.

The procedure for financing ASU design work would not require such detailed presentation if it were not occasionally interpreted incorrectly.

In numerous cases the mistaken opinion emerges that any amount of capital within the limits of the established plan for prime cost can be taken for ASU development, and as long as expenditures do not go beyond the prime cost there can be no complaint about the use of this capital, especially because its use is the prerogative of the enterprises and organizations themselves.

Recording the efficiency of ASU's in the indices of the national economic plan is a very important question. The mechanism through which the state receives its return from ASU's operates only when their influence on production is recorded in assignments to cut prime cost, increase output, reduce materials use norms, and in other technical-economic indices.

If an enterprise or association's indices are properly interrelated and the plan is really a demanding one then a breakdown in introducing the ASU or its inefficient operation will have an immediate effect on fulfillment of the plan for prime cost, profit, labor, and so on.

Then, of course, there will be a different attitude toward the ASU too; it will receive more attention, and people will feel more responsible for using it to full capacity. But where the proper interrelationship is lacking it appears that production is one thing and the ASU is something quite different.

It must be added here that the ministries and departments should give greater attention to recording ASU efficiency in the indices of the plans of subordinate enterprises, production associations, construction trusts, and the like.

One of the significant factors in ASU efficiency which has recently been growing in importance is the systematic character of ASU's, that is, the mutual coordination of particular tasks and subsystems and tying them into a single composite unit. Scattered efforts to automate control do not produce the necessary effect. Furthermore, they are often an obstacle to continued development of the ASU.

Thus, the computing center of the Uzbek SSR Ministry of Communications handles tasks for the intercity telephone station, the Tashkent city telephone network, the material-technical supply administration, Central Telegraph, and the administrative apparatus of the ministry itself.

Considerable work has been done, an effect has been achieved, but still only individual subsystems that are not interconnected are functioning. Tying them together within the framework of the ASU's of these communications enterprises and the sectorial ASU as a whole is becoming more and more difficult because this work will have to be done while seeing that the other ASU subsystems introduced earlier continue to operate.

The sectorial ASU's of the Uzsel'khoztekhnika Association, ministries of construction and agriculture, and Uzbek SSR Main Administration of the Forest Industry also lack the necessary systematic character.

It was decided to begin preliminary certification of the systematic character of all ASU's being set up in the republic in 1976. The certification is done by the Scientific-Technical Council for Republic ASU's headed by V. K. Kabulov, academician of the Academy of Sciences, Uzbek SSR.

In 1976 the Council reviewed the ASU's of the ministries of the food industry, construction, and operation of highways, the Main Gas Administration of the Uzbek SSR, and other organizations of the republic. Where necessary instructions were given to eliminate unsystematic elements and deadlines assigned.

In general, we have already resolved many problems in the field of setting up automated control systems in the republic, but new, equally complex ones are constantly arising. Timely solutions to them will promote a steady rise in the efficiency of ASU's.

Photo-Accusation [caption to photograph that is not reproduced]. The picture shows the appearance of the machine room at the Central Asian Scientific Research Institute of Agricultural Economics. At the Institute an expensive YeS-1020 computer has been operated in an improperly prepared room for three years now. The room still does not have air conditioning and the computer goes down from overheating. The disk memory devices are not protected against dust. According to figures from the Central Statistical Administration of the Uzbek SSR the workload of the institute's machinery last year was just three hours a day compared to a norm of 15 hours.

A similar situation has developed at the Institute's Bukhara division where a Minsk-32 computer has been idle since 1974.

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NEW BOOK ON SETTING UP TERRITORIAL ASU'S REVIEWED

Tashkent EKONOMIKA I ZHIZN' in Russian No 6, 1977 p 87

[Book review by Ye. Yakovenko, doctor of economic sciences, laboratory head at the Central Mathematical Economics Institute of the Academy of Sciences, USSR, and M. Sabirov, candidate of economic sciences, head of the division of information-computing centers of Uzbek SSR Gosplan, of the book "Territorial'nyye ASU" (Territorial ASU's) by doctor of economic sciences A. N. Pirmukhamedov, Izdatel'stvo Ekonomika, 1977]

[Text] The problems of setting up territorial ASU's [automated control systems] are taking on special importance and urgency today. Those who are setting them up, however, face considerable difficulties arising from the fact that our economic science has not yet laid a sufficiently solid theoretical foundation for this work.

The monograph "Territorial'nyye ASU" by doctor of economic sciences A. N. Pirmukhamedov published recently by Izdatel'stvo Ekonomika fills this gap to some extent. It contains interesting information on the principles, methods, and practical procedures involved in setting up ASU's for territorial organizations.

We share the author's point of view concerning the special importance of establishing a set of interrelated model planning problems as the basis for constructing the control system. In this respect the author made successful use of the example of the comprehensively developed Samarkandskaya Oblast in Uzbekistan to show the diversity and complexity of the tasks accomplished by oblast planning commissions.

The monograph considers these problems in close connection with the organizational structure of planning and administration and gives the necessary diagrams and explanation.

Several examples show the unquestionable suitability of the target program approach in planning and administration to the problems of improving planning and administration. This approach is becoming quite widespread in the Central Asian and Baltic republics.

The construction of an ASU requires a systematic approach to solving this problem and the author follows this principle from the very beginning of the classification of automated systems for planning and administration (control). One may also agree that the classification scheme proposed in the book is one possibility. Still, we feel that it is correct and justified to single out interdepartmental ASU's on the national level (ASPR, ASGS, ASU MTS, and others) as a separate class.

To insure compatibility among systems at different levels it is proposed that information-logic tables be made up in which functional tasks are aligned with the structure of the organization. This approach has been followed in preparing design documentation for all systems set up in Uzbekistan using the methodology of the Institute of Cybernetics of the republic Academy of Sciences and the Information-Computing Center of Uzbek SSR Gosplan.

A set of functional subsystems is proposed on the basis of an analysis of the application of ASU's at different levels of territorial administration (republic -- oblast -- rayon) which the author does by comparing the make-up of their administrative agencies. The author calls the planning subsystem realized within the framework of the ASPR [automated system for planning calculations] of Uzbek SSR Gosplan and local agencies the most important of these subsystems.

The book gives the fullest and most detailed treatment to the subsystem "Local Planning Agencies" of Samarkandskaya Oblast and its interrelationship with the republic ASPR for each of its functional subsystems.

The other questions of setting up territorial ASU's, data base and software, organizational and personnel support, are also adequately treated.

The last section of the book is devoted to the very important question of organizing collective-use computing centers. The author gives timely suggestions for basic decisions on the composition and purpose of such computing centers, the need for which was discussed at the 25th CPSU Congress.

The recommendations developed by the author on organizing the operation of such computing centers (called "territorial" computing centers in the book) can be employed in the stage of predesign development.

While noting the purposefulness and practical value of this monograph, which is based on development work by the author and the collective of the Information-Computing Center of Uzbek SSR Gosplan, one must also mention some of its weaknesses. In our view A. N. Pirmukhamedov should have studied the questions of singling out model planning problems more thoroughly and given a fuller description of the essential features of planning a territorial economy.

PHOTOINFORMATION FROM SPACE

Moscow NAUKA I ZHIZN' in Russian No 6, Jun 77 pp 33-36

[Article by Candidates of Geological and Mineralogical Sciences Ya. Kats, A. Ryabukhin and D. Trofimov]

[Text] Already for many years geologists and geographers have successfully used in their work photographs of the earth taken from space. First of all, this makes it possible to get a different view of already known structures on the earth, to look at them from a completely different level. It became possible to check and tie-in earlier compiled fragmentary maps, to clarify that individual structures are interrelated and extend for many hundreds and thousands of kilometers. In a short time surveys from space make it possible to collect information on the geological structure of any region on the earth.

Now we have already obtained many "portraits" of our planet. But it is not merely the question of taking photographs from space, but what to photograph, at what scale, from what orbit and in what color range. The requirements on the materials obtained from space have increased and the problems to be solved have become more complex.

A photographic survey from space is carried out using modern optical equipment on black-and-white, color and spectrozonal (sensitive to some one color) photographic film. During recent years multizonal photographic surveying (simultaneous survey in different zones of the visible spectrum) has been developed considerably and it is being accomplished using multiobjective cameras.

In several examples we would like to show what possibilities a multizonal survey affords for a geological study of individual regions of our planet.

During the past year the Main Administration of Geodesy and Cartography of the USSR Council of Ministers has issued an album containing multizonal photographs of the Kirgizia region. These photographs were taken from the orbital station "Salyut-4" during the flight of the flier-cosmonauts, twice HSU P. I. Klimuk and V. I. Sevast'yanov. The survey was made in July 1975 from an altitude of 340 km by a complex of four cameras, which

simultaneously photographed one and the same sector of the earth in different spectral zones of electromagnetic oscillations. The first zone (0.50-0.60 μm) corresponds to the blue, green and orange color ranges; the second (0.60-0.70 μm) corresponds to the orange and red; the third (0.70-0.84 μm) is for the red and near-IR spectral ranges. Simultaneously the fourth camera made a survey on ordinary color film.

A series of photographs was obtained showing the mountain regions of Kirgizia between Lakes Issyk-Kul' and Sonkel'. It is easy to see the spurs of the Kirgizskiy Range, the Kungey and Terskey Alatau Ranges, the valleys of the mountain rivers Naryn and Chu, populated places, cultivated lands and pastures. One can see the snow cover crowning the high peaks.

What is the value of such photographs for specialists? Of what interest are these black-and-white photographs taken in different parts of the spectrum?

A photograph taken in the range 0.60 - 0.70 μm (Fig. 1b on page 35 in the original text) gives the most complete information on diversified surveyed features. With respect to its expressiveness, it is close to a color image (see color insert to original text, Fig. 1). The phototone here clearly emphasizes the intermont depressions and ranges and the glaciers are clearly defined.

Another photograph (in the zone 0.50-0.60 μm) seems to have less contrast but it gives more complete and interesting information on the structure of the shallow lake Issyk-Kul' and Lake Sonkel' (Fig. 1a). This photograph very clearly shows the valleys of mountain rivers; it is possible to distinguish modern alluvium (sediments), sectors of moistened floodlands.

On a photograph taken in the red and near-IR spectral zone 0.70-0.84 μm the lakes look very dark and the rivers can scarcely be seen, but on this photograph, like on no other, the structure of the region stands out clearly: faults, depressions (Fig. 1c).

Synthesized color images were made from black-and-white zonal images which we have now analyzed (Fig. 1a, 1b, 1c). They differ from usual color photography on which all the features have colors to which our eye is accustomed: the lake is blue-green, the glaciers are white and bright, the mountain ranges are brown and dark brown, the valleys of the mountain rivers and intermontane depressions are of a brighter tone.

On the synthesized images this is not the case. The mountains, rivers, forests and lakes on such images can have the most improbable colors. How are such images obtained and for what are they necessary?

By means of a light filter the initial zonal black-and-white photographs are imparted different colors.

Global space photograph of the earth taken from the Soviet interplanetary automatic station "Zond-5" from an altitude of 90,000 kilometers.

A photograph taken in the first zone was imparted a red color, in the second -- blue, in the third -- green. Then these three images in different colors were combined (projected onto a single screen). This gave a synthesized or artificial color image (Fig. 2a in the color insert in the original text). The lakes look like white frozen glaciers and the glaciers stand out as a black openwork pattern. In the common reddish tone there are a considerable number of hues which, if examined closely, emphasize the differences in the landscapes and mountain vegetation.

Then another variant of optical synthesis was used. The first spectral zone was given a greenish hue, the second a reddish hue, and the third a bluish hue. On this new synthesized photograph (Fig. 2b) the lakes had a dark,

almost back color; different hues of a reddish-brown tone show how with a change in relief and local elevation there is a change in the nature of the vegetation. On this photograph the boundaries of the glaciers stand out particularly clearly.

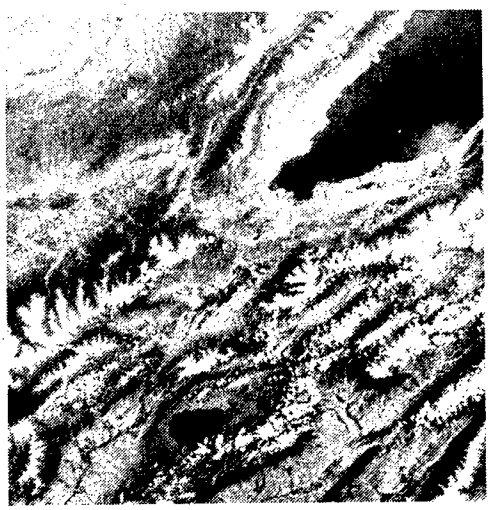

Fig. 1a.

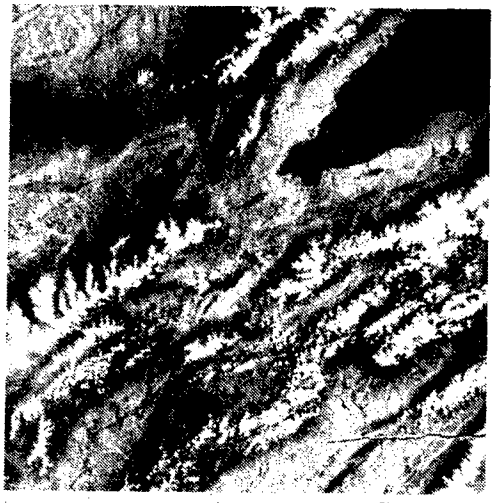

Fig. 1b.

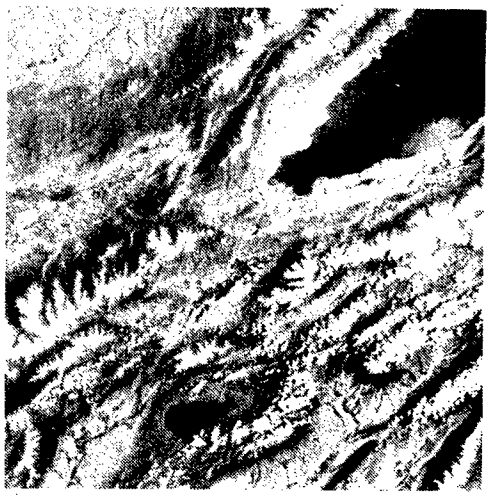

Fig. 1c.

Fig. 1a,b,c. Multizonal space photographs taken from orbital station "Salyut-4" over territory of Kirgizia. 1a -- first zone 0.50-0.60μm; 1b -- second zone 0.60-0.70μm; 1c -- third zone 0.70-0.84μm.

In the third variant of synthesis the first range was imparted a blue hue, the second -- green, the third -- red. This gave an image which with respect to the distribution of colors was close to a real image. But in comparison with a simple color photograph, here the river sediments in the intermontane depressions stand out more clearly. It is true that in this case information on the change in the depths of Lake Issyk-Kul' (Fig. 2c) disappeared.

A multizonal survey makes it possible to add and subtract images in different ranges and thus obtain additional information on natural features. In order to use more completely the reserves of this new procedure it was necessary to employ an electronic computer. The possibilities of our eye in recognizing different phototones are extremely limited. The electronic computer detects very fine changes in tone and brightness, it is possible to break down the image on the basis of density of the phototone and code this gradation with different colors.

This gives an image in which all the sectors of an identical phototone are colored in some one arbitrarily selected bright color. The color clearly defines and emphasizes the boundaries of different natural formations (Fig. 3).

An analysis of a multizonal synthesized photograph yields valuable information, for example, on the geological structure of the region. On the photograph it is easy to discriminate folded rocks of two tectonic complexes -- Caledonian and Hercynian.

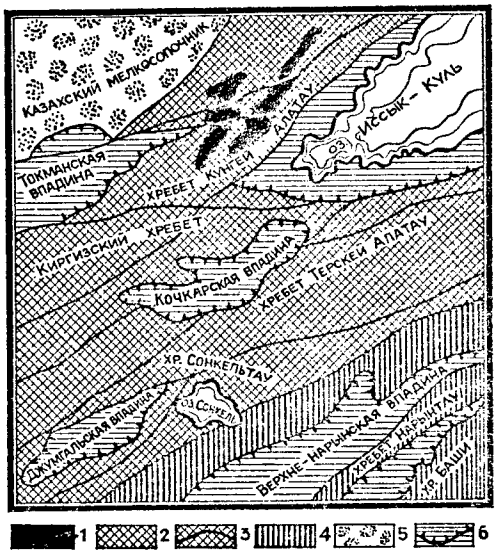

Fig. 2. Geological interpretation diagram. 1. Fragment of ancient earth's crust. 2. Folded rocks of Caledonian complex. 3. Dislocations. 4. Folded rocks of Hercynian complex. 5. Central Kazakhstan median mass cover. 6. Intermontane depressions.

The Caledonian was formed about 550-450 million years ago and the Hercynian about 350-285 million years ago. The Kirgizskiy, Kungey, Terskey Alatau, Sonkel'tau and other mountain structures situated around the depression of Lake Issyk-Kul' constitute the Caledonian complex. Here the rocks are crumpled into steep folds, are highly modified and dislocated, and are cut by intrusive granites. In the Kungey Alatau Range very ancient formations of the earth's crust stand out rather clearly among these rocks. This entire complex of rocks is cut by large fractures in the earth's crust running from northwest to southeast.

The Naryntau and Bashi Ranges, situated in the southeastern part of the photograph, are a younger tectonic complex of the Hercynian period. Here the rocks are also crumpled into folds, but nevertheless this sector was deformed less.

The photograph shows that the Caledonian and Hercynian rocks are separated by a large fault in the earth's crust.

Other multizonal photographs gave a clear idea concerning the distribution of depths in Lake Issyk-Kul', on the nature of the sediments in the river valleys, etc.

Thus, multizonal photographs made it possible in this high-mountain region, very difficult for investigation from the ground, to detect the principal characteristics of its geological structure. In order to carry out such investigations by ordinary, traditional methods would require many years of difficult work. Space photographs have enormous possibilities for the study of the earth's natural resources. To be sure, it is difficult to expect that space photographs will help in the direct discovery of mineral deposits from space. But the scanning of the earth from space altitudes and the interpretation of the photographs taken by different methods will undoubtedly help geologists in carrying out more purposeful searches and will make it possible to define regions promising for exploration for petroleum, gas or ore.

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PHYSICS INSTITUTE IMENI P. N. LEBEDEV

Moscow NAUKA I ZHIZN' in Russian No 9, 1977 pp 36-39

[Article by V. Oranovskiy, candidate of engineering sciences, "A Workday at the FIAN."]

[Text] FIAN--the Order of Lenin Physics Institute imeni P. N. Lebedev of the Academy of Sciences of the USSR, is known all over the world and is one of the largest research centers in the country. It does scientific research in practically all fields of modern physics.

The brief remarks published below are about what happens in a number of departments and laboratories of the FIAN during one ordinary day--the 10th of May. To a certain degree, these remarks reflect the scale of work and the variety of subjects worked on by the institute. The remarks also name a number of urgent scientific and engineering problems which physicists are working on today.

Thus, Moscow, the FIAN, 10th of May 1977...

FIAN staff workers participate actively in the socialist competition for a worthy reception of the 60th anniversary of the Great October. Fulfilling the directives of the 25th party congress on strengthening the ties between science and production, the FIAN people assumed, together with the Moscow "Krasnyy Proletariy" Plant, the obligation to develop and introduce a laser method for welding parts of metal-cutting machine tools. On the 10th of May a group of staff workers in the party committee of the FIAN discussed the progress in the fulfillment of this obligation.

In the Quantum Radiophysical Laboratory, headed by academician N. G. Basov, start-up work was continued on the first stage of the "Del'fin" installation designed for research on controlled themonuclear synthesis initiated by laser radiation. Some 54 laser beams with a total energy of about 5000 joules were focused in a vacuum chamber. These laser beams must create simultaneously a very short and very powerful light pulse about one billionth of a second long. A "very powerful" means, in this case, that the power of this pulse will exceed the power of all electric power plants in the world.

In this same laboratory, in the "Continuous Chemical Lasers" group, tests were continued, on 10th of May, on laser separation of nitrogen isotopes in chemical reactions occurring under unbalanced thermodynamic conditions. A hundred-fold enrichment was achieved of a gas mixture of the ^{15}N nitrogen isotope, while in the present methods of separating isotopes it is possible to obtain only a ten-fold enrichment. In the future, these investigations may lie at the basis of an industrial method for producing the ^{15}N nitrogen isotopes which will make it available to a number of industries that need this isotope.

In the same laboratory, in the semiconductor electronics sector, under the guidance of P. G. Yeliseyev, doctor of physico-mathematical sciences, in cooperation with specialists of the Government Scientific Research and Planning Institute of the Rare Metals Industry, heterolasers are being developed--the most promising version of semiconductor injection lasers. This collective found a new industrial solution to the heterolaser problem based on changing over to creating more complex, multicomponent semiconductor crystals. This opens up broad possibilities for the selection of pairs of substances compatible in the heterotransition and having, at the same time, the necessary electrophysical and optic characteristics. Tests on the creation and study of new structures were made on this day.

On 10th of May, at the routine seminar of the Quantum Radiophysical Laboratory a report was made on the work of V. I. Kovalev and F. S. Feyzullov on the study of physical processes occurring when transparent materials are destroyed by infrared radiation of powerful CO_2 lasers. The authors substantiated experimentally the mechanism they proposed of laser punctures on the surface of the optical elements.

At the Oscillation Laboratory, managed by academician A. M. Prokhorov, a meeting was started at 1100 of the "Interaction Between Radiation and Materials" Department of the Moscow Physio-Technical Institute. This department uses this FIAN laboratory as a base. On the day's agenda is the question of the readiness of the sixth year students to defend their theses. During the intermission, the laboratory's manager mailed to the POLITICHESKOYE SAMOOBRAZOVANIYE journal a long-promised article "Fundamental Research--A Source of Scientific-Engineering Progress." He was able to complete it before Victory Day--he had two days off. Immediately after the meeting of the department, the academician conducted planned discussions of several research groups.

The senior scientific staff worker of the Oscillation Laboratory, Ye. M. Zolotov, demonstrated a system for transmitting a TV picture by means of a laser beam, which was completed before the May holidays. The picture signals are transmitted over a glass fiber 0.15 mm in diameter and one kilometer long.

In the same laboratory, engineer Yu. N. Kotlov, began installing apparatus for optical studies at low temperatures and high pressures. The installation will be exhibited at one of the exhibitions abroad dedicated to the 60th anniversary of October.

Section manager in the Oscillation Laboratory, A. A. Manenkov, and senior scientific staff worker, Yu. K. Danilenko, were preparing materials for the sale of licenses for apparatus they developed for healing glaucoma by means of laser pulses.

The group studying magnetic semiconductors could not reproduce one interesting physical phenomenon they discovered in a previous series of experiments several days ago. The reason for that is incomprehensible.

The gas labor group of the Optical Laboratory, headed by professor M. M. Sushchinskiy, is doing research on physical processes in pulse lasers with gold and copper pairs. These lasers are distinguished by extremely high amplifying properties. Tests were made in which lasers with gold and copper pairs were used for amplifying the brightness in a laser projection microscope system.

A simplified arrangement of this laser projection microscope is shown in the figure [not shown] where letters AC indicate the laser brightness amplifier itself, P_1'--the object in the field of vision of the microscope, O--the lens of the microscope, P_1''--the intermediate amplified image, 3--the projection system, P_1''' --the image on the screen.

The amplification of weak light beams by means of a laser amplifier, realized for the first time in this system, makes it possible to increase the brightness of the image a huge number of times without increasing the illumination of the observed object. This is frequently a very important advantage, especially in studying biological objects.

The Spectroscopy Laboratory, headed by professor S. L. Mandel'shtam, held a working session with the staff workers of the Space Center of the Academy of Sciences of the Polish People's Republic. Results of recording X-ray radiation of solar flares by the "Interkosmos" series satellites were discussed. X-ray measurements made by satellites and rockets are an important source of data on the physical processes in the hot nucleus of solar flares. Experimental studies of the sun's X-ray radiations have been conducted in the laboratory since 1957, while in 1974 the first large experiment on X-ray astronomy in space outside the solar system was made from the piloted "Salyut-9" orbital station.

Cosmic rays are a traditional subject of the FIAN. An All-Moscow seminar on cosmic rays was held in the morning and then, at the Scientific Council of the Cosmic Rays Laboratory, headed by professor S. I. Nikol'skiy, materials presented at the 15th International Conference on Cosmic Rays were discussed.

The general conclusion on the majority of considered experiments concerned the so-called scale invariance. It is possible to observe in cosmic rays the collision of heavy particles--adrons--at energies so far unavailable to accelerators. It was established that in a certain limited interval of high energies the general features of inelastic collisions of adrons remain practically unchanged (invariant) with respect to energy. However, after some threshold energy region in the order of 10^{14} electron volts--all processes concerned with collisions change very sharply.

In the large hall of New Accelerators Laboratory (headed by professor A. A. Kolomenskiy), an experiment is being done on the powerful high-current electron accelerator from the series of studies on controlled thermonuclear synthesis. In a short pulse, lasting tens of millionths of a second, the accelerator develops a power equal to dozens of Bratsk GES.

Focusing the electronic beam in space makes it possible to obtain the emission of huge power in a small volume of the target, which is used to produce microscopic explosions of small balls with deuterium compounds.

In the Laboratory of Semiconductor Physics, headed by academician B. M. Vul, experiments were being made on studying physical processes which, in the future, may lead to the creation of new types of semiconductor devices. A germanium crystal was placed in liquid helium at a temperature of 1.5K. In one part of the crystal, the powerful laser pulse creates "electron-hole drops"--spherical plasma clusters with a radius of 5 to 10 microns. In the other part of the sample, sound-phonon quanta are generated by means of current or light pulses. The phonons interact with the electron-hole drops and accelerate them to speeds close to that of sound. The motion of the drops is monitored by a laser or an electrical probe. Much still needs to be understood and tested here.

At 1000, staff workers of the superconductivity sector of the Theoretical Physics Department, headed by academician V. L. Ginzburg, meet in a seminar to discuss the possibilities of obtaining high temperature superconductivity by using an exciton mechanism and the limitations of such a mechanism imposed by the requirements of the stability of the system.

At 1500, the traditional All-Moscow seminar of the Department of the Theoretical Physics--"The Tamm Seminar," began in the conference hall of the FIAN. This seminar started in the thirties. It discussed urgent problems in the theory of strong ("...topological decomposition in the Redzhevskaya Theory...") and weak ("...neutrinos of high energies...") interaction of elementary particles. Theoretical seminars of the FIAN attract physicists from many Moscow institutes. The popularity of the seminars may be judged indirectly by the fact,that as a rule the FIAN administration assigns the biggest hall in the institute for this purpose.

All research is done by a friendly multithousand collective of the institute. The most complex experiments are prepared by the skilled hands of workers and technicians. They, as all FIAN people, are characterized by initiative, a creative approach to work and a desire to make their contribution to the progress of Soviet science.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

NEW SCIENTIFIC-TECHNICAL COORDINATION UNIT

Moscow EKONOMICHESKAYA GAZETA in Russian No 16 Apr 77 p 7

[Article by V. Zuyev, Chairman of the CPSU Tomsk obkom scientific-coordination council, corresponding member of the USSR Academy of Sciences: "The Party Obkom Council Coordinates"]

[Text] Tomsk is one of Siberia's major fast-developing scientific centers. Added within a short period of time to the complex of Tomsk VUZ's that have been traditionally engaged in fundamental and applied research were newly created institutions of the USSR Academy of Sciences Siberian Branch--the Institute for Petroleum Chemistry, the Institute for Atmospheric Optics, together with the autonomous high-voltage electronics division, the SKB ["Special Design Office] "Optika," and the soil appraisement laboratory of the Institute for Soil Science and Agronomy. Today the total number of scientific researchers in Tomsk exceeds 1,600 persons.

The decree of the CC CPSU on the activities of the USSR AN [Academy of Sciences] Siberian Branch gave high marks to the experience gained by the Branch scientists in the development of fundamental and applied research and in the strengthening of industry-science ties, and the decree spells out problems that require resolution. This decree was received with satisfaction by the scientific collectives of Tomsk. The general meeting of Tomsk scientists which took up tasks emanating from the CC CPSU decree devoted considerable attention to problems in coordinating the research of academy institutions, VUZ and industrial institutes, and the concentration of efforts on fulfilling major complex programs. We have on hand specific experience in that regard.

Council Composition and Functions

A scientific-coordination council operating on a voluntary basis was created within the obkom's section on science and teaching institutions at the initiative of the Tomsk party obkom. Included in the council are leaders of all the scientific-research institutions, regardless

of their jurisdictional affiliation, the directors of the major industrial enterprises and associations, and the pro-rectors for scientific affairs at all of the Tomsk VUZ's. The council has a total of 30 persons.

From the first days of the scientific-coordination council's creation, its functions were concisely outlined, the principal ones of which include: the consolidation of efforts on the part of all scientific institutions in the oblast with respect to solving national economic tasks, constant and operative mutual information transmission which allows for the utilization and rapid dissemination of experience and problems related to scientific-administrative activities.

One recalls the council's first session which discussed particularly specific questions as: What is being done at the NII [scientific-research institutes] of the city and oblast? What kind of material and technical base is at the disposal of each one of the scientific subdivisions? What kind of experiments have been conducted and what has been their effect?

The picture obtained was far from a happy one. Neighboring NII and VUZ's find out about successful projects oftentimes through Moscow, and valuable experience is frequently not at all disseminated, and the material-technical base is created according to the principle: "Where is the feast and where is the famine." A number of scientific institutions have not even made a qualitative evaluation of its collectives' operations, not even along approximate criteria.

There have been cases of unsubstantiated expenditures of time and money on random, unpromising projects. Some comrades have doubted that departmental barriers exist or would exist, and that no kind of council could break those barriers.

I am talking about this as a first administrative step without which one could not make further moves to coordinate the efforts of VUZ, academy and industrial science. A detailed analysis of the state of affairs at scientific institutions has made it possible to work out a number of specific proposals aimed at coordinating efforts there.

Forms of Research Cooperation

The first stage in such coordination became the practice of concluding scientific-technical cooperation agreements between institutes and industrial enterprises. Those agreements precisely outlined the basic directions of cooperation and the general obligations of the parties involved. This leads to an operative solution of project problems, the manufacture and introduction of any one particular innovation, and specifically defines the necessity and effectiveness of such work.

And we already see the effectiveness. During the years of the Ninth Five-Year Plan alone, the Tomsk VUZ's and the NII completed contractual scientific research projects valued at 105 million rubles. The economic effect resulting from the introduction of those projects is estimated to be 295 million rubles. Within a short period of time the Siberian Physico-Technical Institute introduced 79 projects having a total economic effect of about 15 million rubles. Here, in particular, there were created six types of electronics instruments, two of which are already in series production.

The second stage in the activity of the scientific-coordination council is tied to the organization of research on major complex programs. Thus, with the active assistance and support of the party obkom, the council began the development of an automatic control system of a national economic region, to be tested in the Tomskaya Oblast within the framework of an all-union experiment. Participating in the development of this complex program are all the scientific institutions, but the leading position rests with the scientific-research institute for automation and electromechanics of the Tomsk Institute for Automated Control Systems and Radio Engineering (TIASUR) which has already gained considerable experience in concentrating the efforts of physicists, mathematicians, chemists, biologists, economists, philosophers, sociologists, and medical specialists with regard to solving a single complex problem.

And in this we see one important aspect. The TIASUR is a teaching VUZ. At first glance it would seem that a VUZ is a VUZ, and its tasks are determined within a teaching framework. But a distinguishing feature in the formation of the scientific complex in Tomsk is its very close tie to VUZ science, the mutual assistance of VUZ's, industrial and academy institutes in the training of cadre, and in the rational utilization of equipment for scientific research, and finally, the joint evaluation of topics selected for research and development. Today, it has become a customary practice for the departments and laboratories of VUZ's and their NII to participate jointly with academy institutions in the fulfillment of complex scientific programs.

One additional complex problem is now being resolved at the initiative of the scientific coordination council's members--"The Automation of Scientific Research and Manufacturing Processes." Additionally recruited into research on this problem are specialists from academy science, VUZ science and from the enterprises. The USSR Academy of Sciences Siberian Branch Institute for Atmospheric Physics and the Siberian Physico-Technical Institute.

The scientific-coordination council sees its primary task as that of conclusively eliminating departmental and interdepartmental barriers between VUZ's, their NII, industrial institutes, design offices, and

academy institutions. The work experience of scientific collectives under various jurisdictional affiliation has been studied, discussed and approved at bureau sessions of the party obkom. Also approved was the work of the scientific-coordination council.

The initiatives and proposals made by the council are being actively supported by the workers of scientific institutions as well as by the industrial workers. The detailed study and broad discussion of such problems as the evaluation of scientific research effectiveness and the strengthening of bonds between science and industry on an oblast-wide scale, and the specific recommendations made in the course of their revue at the council have helped many persons make a realistic evaluation of the situation at hand and helped them to identify available opportunities for the further concentration of scientific forces with respect to the resolution of national economic tasks. The council's operations are based on the principle of not becoming carried away by insignificant inspections and frequent sessions. The council meets two or three times a year, but prepares for those sessions in a substantive manner.

Strengthen the Experimental Base

The council's members have now succeeded to the point where all of the VUZ and industrial NII have a system of criteria for evaluating scientific activity. All the best that has been accomplished at various institutions with respect to problems in socialist competition in the scientific collective is being broadly disseminated. All of the scientific subdivisions today have five-year plans of cooperation with industrial enterprises. However, we clearly see that Tomsk's scientific potential is far from being fully utilized. We cannot find satisfaction in the continuing low degree to which scientific projects are being practically utilized, nor can we be happy with the low level at which the practical realization of inventions takes place at a time when there has been a rather large number of patents received. Much has to be done to improve licensing operations.

And here we see a solution of the problem in the strengthening of the experimental base, in an improvement of material-technical supply at academy and VUZ scientific institutions. At times even most intense cooperation of local forces turns out to be futile. A fact is a fact: Experimental base and material-technical supply as yet do not satisfy current needs at academy and VUZ institutions, i.e., at places where basic fundamental research is being carried out. At the same time this problem has been more or less satisfactorily resolved at industrial NII.

We have, what is in our view, a rather paradoxical situation. The Academy of Sciences and VUZ's are supposed to be in the forefront of scientific and technical progress, yet tools and materials in short

supply are not being supplied on a priority basis. The scientific-coordination council's work has shown that we can resolve part of this problem by redistributing available resources by means of a timely discontinuation of directions holding little promise. But this is only a partial solution. It is apparent that there is a need to alot some reserves for science at pilot plants of industrial NII and at industrial enterprises. This means small-scale industrial material resources, but this would be recovered many times over by new research results and would have a positive effect on the development of scientific-technical progress as a whole.

Today, all of Tomsk's academy, VUZ and industrial-scientific organizations are working to realize the socialist pledges taken in honor of the 60th October anniversary, and are working to fulfill the tasks outlined in the CC CPSU decree concerning the Siberian Branch of the USSR Academy of Sciences. And there is no doubt that the scientific-coordination council of the party obkom will be a good assistant to the party and the managerial organs as well as to scientific institutions in resolving those tasks.

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